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DEPARTMENT OF PUBLIC INSTRUCTION

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COURSES OF STUDY IN SCIENCE

GRADES FOUR, FIVE AND SIX

Bulletin 72A

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FOREWORD

THE need for an articulated and coordinated course of study in science for the twelve grades of the public school system has long been recognized. It is a special pleasure, therefor, to announce the completion of such a course.

The course of study for the first six grades was prepared by Helen Purcell, Director of Elementary and Kindergarten Education. In the interest of economy this course has been divided into two parts: Bulletin 72 covers the work of grades one, two and three, and Bulletin 72A covers the work of grades four, five and six. The work for grades seven, eight and nine is included in a separate bulletin. A fourth publication covers the work for grades ten, eleven and twelve. These materials are part of a general program of curriculum reorganization developed under the general direction of William H. Bristow, Deputy Superintendent, Curriculum Bureau.

Valuable help in the preparation of this material was given by other departments of the State government, whose work includes scientific fields. This, we believe, is unique. The material also incorporates the best thought of representatives of other bureaus in the Department of Public Instruction, particularly the Vocational Bureau, in connection with this field.

This course of study was distributed in mimeographed form during the school year 1929. Teachers were asked to submit criticisms and suggestions. Many of these suggestions have been incorporated in the present course. Doctor George R. Green, Professor of Nature Study, Pennsylvania State College; Dr. E. E. Wildman, Director of Science, Philadelphia; and Mr. Arthur Clark, Supervisor of Science, Philadelphia, reviewed the material in detail and offered many constructive suggestions.

JAMES N. RULE
Superintendent of Public Instruction

May 1, 1932

Courses of Study in Science for Grades Four, Five and Six

Science as a School Activity

Outcomes of Science in Terms of Personal Assets.—Science, in common with all the subjects of study, should contribute to the preservation and development of desirable moral and civic qualities. These partly grow out of the life of the school as it is affected by the activities related to the subject, and partly through innate opportunities in the subject itself. Within its specific fields a study of science in the first six grades should center around familiar facts and phenomena. With these as a background it should seek to give the pupil the beginnings of scientific knowledge; to lay the foundations for future scientific growth; to develop the habit of seeking information at its source; to protect and expand the child's interest in nature; to point out the need for preservation and development of natural resources; to set up the beginnings of a sense of the importance of science in the life of the world; to fill the pupil with a desire for the truth and show him the need for proof; to give him the foundations for a scientific method of thinking.

Importance of Relevant Experiences.—A realization of the outcomes listed above implies that a study of science is a series of experiences in the expression of these outcomes. The suggested activities included in each unit are an attempt to help the teacher in the organization of such experiences. It is not intended that these activities shall be carried out in their entirety or that they shall take the place of activities that in the judgment of the teacher are more suitable to the situation. They are intended only to point toward the type of method that should prevail, and to provide the teacher with help in organizing activities suited to her particular problem and environment. Knowledge obtained from books has a limited place in a study of science in the first six grades. Actual contacts with the materials involved should be sought. The pupil should be helped to find knowledge where it exists; to seek it from those who know; to make a study of science a concrete and active process.

Reference Material.—The large part taken in the preparation of this course of study by other departments in the organization of the Commonwealth has been mentioned in the Foreword. Much material in scientific fields has been prepared by these departments. This material was constantly used in the organization of the courses of study for the first six grades and is necessary to their best interpretation. These bulletins may be obtained by superintendents upon application to the departments publishing them. It will be necessary, however, to consider these bulletins as permanent reference material. The cost of publication is large and their distribution will necessarily be limited to reasonable numbers. Valuable bulletins respecting problems in science may be obtained at slight cost from the United States Government. Lists of such material may be obtained by addressing the Superintendent of Documents, Washington, D. C.*

A number of problems included in the course of study are not covered by the bulletins suggested above. Reference material relating to these problems is necessary to complete instruction. In addition, the teacher of science needs material at hand that will enable her to satisfy extensions of her curiosity, and to answer questions that may be raised by the pupils that the bulletins listed may not cover. A helpful list of such additional material is suggested. Where the title of the book or bulletin specifically indicates the material covered, it is listed following the course of study for the grade only. If material is needed that is not clearly indicated in the title, a detailed reference is inserted following the point to which it refers. So, too, information not generally obtainable is included in the text. All reference material with publishers is listed in the bibliography at the close of the course of study.

Visual Material and the School Journey.—The stereograph, the slide, and the moving picture are necessarily a part of a highly effective study of science. Suggestions for a minimum use of such materials toward which the school should work are included. Pictorial material and object-specimen materials are frequently suggested. Museums in the community or nearby should be capitalized to the fullest extent. All materials suggested for study may be seen clearly with the naked eye. The simple microscope and the field glass, however, are sources of great joy to the child. So, too, a compound microscope uncovers marvelous things. None of these, however, are necessary to the development of the course of study as organized. They are valuable supplemental helps only.

The school journey is frequently listed as a suggested activity. Such a suggestion may be carried out in several ways:

1. The entire class may make the visit during school hours or at some other period arranged by the teacher and the class.
2. Individuals or groups may make visits suggested outside of school hours if the point to be visited is within the immediate neighborhood and the children have reached an age that makes a safe journey probable.
3. Individuals who have opportunities for transportation may make visits and report the results of their observations to the class.

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*Such a list costs ten cents. Stamps are not accepted.

Additional information as to standards, equipment, and supplies in the fields of visual material and the school journey may be obtained by addressing the Director of Visual Education, Department of Public Instruction, Harrisburg.

Use of the Radio.—Where a school radio is .available, arrangements should be made for the reception of talks that correlate with the course in science. Pupils should also be stimulated to "tune in" on relevant science talks that are given in the early evening. Such talks may be reported in class for the benefit of pupils who do not have radios and for purposes of general discussion.

Encouragement of the Pupil with Special Scientific Aptitudes.—The Edisons and Marconis of the future are now in our schools. To discover and encourage unusual talent is a specific obligation of the teacher. Individual projects should be encouraged, "Fad" exhibits planned and in every possible way special talent encouraged and developed.

Unifications and Correlations.—Each teacher should examine the units suggested for the grade for possible unifications or correlations with other units in science or with other subjects of study. Economy of time and effort should always be sought. A school journey suggested in connection with one unit not infrequently may be made to include material in another unit or may contribute to another subject of study. As pointed out, the course of study in science is suggestive only. The manner of its use is in the hands of supervisory officials and teachers.

Mastery of Essentials.—Care must be taken, throughout the course, to keep the material within the comprehension of the child. The organization of complicated material is beyond the capacities of the pupil in the first six grades. The course seeks primarily to give him simple scientific experiences within the limits of his environment and to stimulate his scientific interests. Facts required are limited. Additional facts to be mastered must be determined by supervisors and teachers. Communities differ in their scientific backgrounds. Supervisors and teachers differ in their opinions as to what is of primary importance. Decisions, however, should be made and results obtained.

Fitting the Course to the Community

Limitations of a State Course of Study.—An attempt has been made to correyate this course of study with the scientific resources and activities of the Commonwealth; to make these a center for the development of larger scientific interests and activities. A course of study prepared for a State as large as Pennsylvania, however, is unavoidably general in character. The backgrounds necessary for the development of some of the problems included may not exist in certain communities nor in nearby territory. On the other hand, scientific materials close at hand may be omitted. So, too, the apartment-house dweller is not likely to have space for a garden and must necessarily find his field of garden practice in window boxes and flower pots. The same principle holds true with respect to seasonal differences. Spring comes earlier in the Southern part of our State than in the Northern part; highlands and lowlands show similar differences. The course of study offered, therefore, is suggestive only of what may be done. The problem of fitting it to the materials and conditions of a specific community is the task of the officials and teachers of that community. This should be undertaken at once and carried to tentative completion as soon as possible.

Opportunity for Choice and Substitution.—Examples of specific community differences are found in the trees, bushes, vines, common to the locality; in the garden flowers generally cultivated and in the wild flowers with which the group may reasonably be expected to become acquainted through observation. The scope of the lists given in the Appendix exceeds the requirements of the course. Such substitutions, eliminations and additions should be made as are necessary to make these lists of maximum use.

Suggestions for Installing the Course

Need for Adjustments.—In introducing this course of study, teachers should remember that no class beyond the first grade will be prepared to take up the work as outlined; that the second grade will not have the backgrounds for this grade for another year; that it will take two years before the third grade is adequately prepared for the material outlined; three years for the fourth grade; four years for the fifth grade; five years for the sixth grade. In the meantime, adjustments necessarily must be made. Identifications should be reduced to reasonable proportions; material not necessarily related to the work of previous grades should be emphasized, or specific topics chosen and work suggested for preceding grades included. In short, adjustments must be made to fit the situation.

A New Adventure.—The teaching of science will be a new adventure for many teachers in the first six grades. It may be that some teachers will feel unprepared to carry on the work and will approach it with misgivings and timidity. No teacher should be worried. Rather teachers should learn with the children; enjoy with them the discovery of new wonders in nature's realms, the thrill of simple experiments that introduce vital principles, the immensity of modern scientific advances. The world today is a scientific world. The future promises to be still more scientific. He who lives fully today or tomorrow or within a more distant period must be part of such a world. Let us all learn together to capitalize the assets and enjoy the marvels that a scientific world possesses.

GRADE FOUR

AUTUMN

I. FLOWERS

A. Problems and Experiences

1. To extend identification of flowers.
2. To extend experiences in Autumn planting of flowers.

B. Suggested Activities

1. Each pupil determine his favorite Autumn flower. Make picture of this flower.
2. Organize an exhibit of Autumn flowers.
3. Identify ten garden flowers that are in bloom in Autumn. Look especially for flowers among those listed for Autumn for Grades I-IV, Appendix.
4. Discuss successes and failures with respect to flowers planted in previous Spring. Try to find reasons for both.
5. Interview people in community who are successful in securing Spring flowers from Autumn planting as to best flowers to plant.
6. Plant some of these plants in school yard or home yards or in both.
7. Determine type of soil favorable to growth of plants chosen, depth of planting, and other factors affecting growth.
8. Include Iris in Autumn plantings of flowers.
9. Pupils plan for plantings in pots so as to have house plants in blossom in Winter or early Spring.

II. BIRDS

A. Problems and Experiences

1. To extend knowledge of birds: in the home region, in the State as a whole, in the United States, in other parts of the world.

B. Suggested Activities

1. Identify seven birds observed in community in Autumn. Look particularly for birds among those listed for Grades I-IV, Appendix.
2. Note foods of birds identified.
3. Pupils collect three or four unused bird nests if they may be safely obtained in community or nearby, or make artificial nests that imitate nests of specific birds. Cut out of paper and color the male and female of the birds that occupy such nests. Arrange nest so as to indicate natural location. For example, place nest found in tree on branch of a similar tree. Place father and mother birds in typical situations. Attach card giving species of bird.
4. List two birds found in other parts of the State that are not common locally. Obtain pictures of such birds.
5. List two interesting birds in the United States that are not common in the State of Pennsylvania. Examine pictures of these birds. Decide why they do not live in home state.
6. List two or three interesting birds in other parts of the world as the Ostrich, the Condor. Examine pictures of these birds. Consider their habits; whether they are harmful or helpful to man.
   Desirable: Stereographs of birds not found in the United States. See Catalog 24, Keystone View Company, Meadville, Pennsylvania.

III. SEASONS

A. Problems and Experiences

1. To learn meaning in terms of day and night of Autumn Equinox.
2. To sense a relationship between the length of day and night and the position of the sun.
3. To master names and order of months in year.

B. Suggested Activities

1. Note day in Autumn on which day and night are of equal length. (Look in dictionary under Equinox.)
2. Find equator on globe or draw equator around ball. With light and globe or ball experiment with light held over equator. Note that rays of light extend equally on both sides of the equator. Move light toward poles of globe or ball and note differences in relation to equator of areas that light strikes.
3. Mark length of shadow of pole on this day. (Note hour at which marked and continue to use this hour in future marking of shadow).
4. Master names of months in year with order in which they come.

IV. MUSHROOM AND TOADSTOOL

A. Problems and Experiences

1. To find how mushrooms and toadstools reproduce themselves; how to discriminate between mushrooms and toadstools.

B. Suggested Activities

1. Break out the stem of the mushroom or toadstool, and lay the cap gills downward on a glass plate, covering it with a cup or other vessel to keep it from drying out too rapidly. Leave without disturbing for two days. Then carefully lift the cup from the glass.
   Answer this question: What is left on the glass when the mushroom or toadstool is lifted?
2. Discuss what will happen if these mushroom or toadstool spores are blown out into the air.
3. Determine how to tell a mushroom from a poisonous toadstool. (Emphasize need of care in this. If children live in a neighborhood where wild mushrooms are likely to be picked the following three-fold rule will be helpful. It is a mushroom (1) if it is taken from cultivated fields or pasture, (not from woods); (2) If it has pink or flesh colored gills; (3) If it has a ring on the stem when old, or a veil over

the gills when young. These rules may easily be committed to memory in the following verses:

(1) "How can I tell a mushroom wild?"
"By this simple threefold rule, my child:
Its stem has a ring around,
It has pink gills facing the ground,
And in fields, not in woods, it is found."

(2) "Mother, mother, what is a mushroom?"
"If in the fields you meet it
With ring on the stem and pink gills beneath
It's a mushroom and you may eat it."

4. Discuss large production of mushrooms in Pennsylvania.
5. Locate on map chief center in the growing of mushrooms in the state.

V. ANIMALS, REPTILES, AND BATRACHIANS

A. Problems and Experiences

1. To set up friendly relations with wild animals, batrachians or reptiles in neighborhood, as toad, turtle, rabbit.

B. Suggested Activities

1. Each pupil try to secure the friendship of a harmless wild animal, reptile or batrachian common to neighborhood. Place animal in enclosure or cage or develop friendship in natural environment.
2. Pupils make frequent reports as to progress in setting up friendly relations between themselves and these pets.

VI. INSECTS AND ARACHNIDS

A. Problems and Experiences

1. To extend observation of butterflies and moths.
2. To study the potato bug as a type of beetle.
3. To extend knowledge of spiders; how the spider is reproduced; parental care among spiders.

B. Suggested Activities

1. Gather pupae of moths and butterflies and place in schoolroom for future observation. Try to include cocoons of the Promethea Moth. (Most commonly found on Cherry, Sassafras, Ash, Sycamore and Tulip trees.)
2. Note potato beetle on potato stalks in home gardens and potato fields. Compare wings with those of the fly. Determine distinguishing marks of a beetle.
3. Squeeze potato beetle a little and note ill-smelling liquid exuded. Discuss the value of this liquid in protecting potato beetles from birds and other enemies.
4. Learn main facts in history of the potato beetle; where it originally lived; reasons for its increase and spread.
5. Find from people whose potato gardens or fields have few potato beetles how they accomplish this. (U. S. Department of Agriculture, Farmers Bulletin 1371, Diseases and Insects of Garden Vegetables, p. 34)
6. Establish a nest for the potato beetle. Place five or six inches of soil in bottom. Place a number of adult potato beetles in nest. Keep supplied with potato stalks while these may be found. Also place pieces of raw potato in nest. Sprinkle a little water on soil occasionally. Note how potato beetle eats. Compare with methods through which moths and butterflies obtain food. Note potato beetle burrowing into the ground as cold weather approaches.
7. Identify the beetle called Lady Bird (Lady Bug).
8. Compare method of flying with that of potato beetle. Find other similarities.
9. Find in what way the Lady Bird is helpful to plants.
10. Note other beetles.
11. Organize special characteristics of the beetle.
12. Find eggs of spider. (Found in different places according to habits of spider; such as on a stone, within folded leaves, on boards, in crevices of rocks, suspended in webs attached to the branches of weeds or shrubs) Place each batch of eggs with material to which it is attached in a glass jar or other glass receptacle with thin cloth tightly tied over top. Watch eggs hatch. (Spiders generally hatch in early winter but remain in the nest until spring feeding on one another).
13. Open some nests in early Autumn and estimate number of eggs in each.
14. Open some other nests when spiders are first hatched and estimate number of spiders. Note approximate number of spiders that eventually emerge from a nest. Explain differences between number of eggs, number spiders when first hatched and number of spiders that eventually emerge from the nest.
15. Identify the Orbweb spider and Orange Garden spider.
16. Make pictures of these spiders.
17. Discuss parental care on the part of the Running spider or Wolf spider (Gerald Craig, Tentative Course of Study in Elementary Science for Grades I and II, p. 82).

VII. DISEASES IN GARDEN VEGETABLES

A. Problems and Experiences

1. To note diseases that attack the cabbage and other crops of this family.
2. To find methods for prevention and extermination of such disease.

B. Suggested Activities

1. Each pupil examine cabbage, cauliflower, or brussel sprouts in his own or neighbor's garden for diseased plants.
2. Try to identify one or two most common diseases found.
3. Find reason for such diseases and means for prevention and cure.

VIII. PROTECTIVE COLORING AND BEHAVIOR

A. Problems and Experiences

1. To learn advantages of protective coloring and behavior in insects, spiders, and animals.

B. Suggested Activities

1. Note spiders and insects that are difficult to see because of resemblance to their surroundings.
2. Pupils discuss other cases of protective coloring with which they are acquainted.

3. Discuss advantages of protective colorings.
4. Note behavior of potato beetle when handled. Discuss how "playing dead" may help the potato beetle to escape injury.
5. Pupils tell stories of other cases of "playing dead" that they have observed.

Desirable: Stereographs showing protective colorings of some insects and moths. See Catalog 24, p. 17, Keystone View Company, Meadville, Pennsylvania.

IX. RAINFALL
   A. Problems and Experiences
      1. To learn how rainfall is measured.
      2. To find yearly rainfall in community. (This includes water from snow).
   B. Suggested Activities
      1. Review experiments and material respecting rain in Grade III.
      2. Place receptacle where rain will fall into it normally (A fairly large receptacle should be used). Estimate depth of water in receptacle after rain has ceased.
      3. Pupils learn that this measure indicates depth of water that fell over entire area in which storm occurred.
      4. Repeat measurement each time it rains until the meaning of depth of rainfall is well understood.
      5. Estimate total rainfall during periods in which rain was measured.
      6. If the local press furnishes information respecting depth of rainfall compare their reports with school findings. If these differ discuss probable reasons: (Exact measurement is improbable with an ordinary pan and ruler; measurements reported in press are made with much exactness).
      7. A group or an individual visit a weather station if this can be arranged and report to remainder of class how rainfall is measured.
      8. Find the attitude of people who have gardens or farms with respect to the season's rainfall. Has there been enough? Too much? Not enough?
      9. Discuss relation of Autumn rains to Spring growths.

X. FISH
   A. Problems and Experiences
      1. To learn reasons for conservation of certain kinds of fish.
      2. To extend identification of fish.
   B. Suggested Activities
      1. Determine why the Bass is a favorite food.
      2. Examine pictures of the Black and White Bass. Examine these fish if there is opportunity for this.
      3. Find season in which Black and White Bass may be legally caught.
      4. Discuss reasons for limitations. Decide reasons for requiring licenses to fish.
      5. Find how the supply is kept up in Pennsylvania.
      6. If a Bass can be obtained alive, place in tub or other receptacle filled with water and note colors and manner of swimming.
      7. Find the foods upon which the Bass feeds: the type of streams in which it thrives.

XI. GEOLOGICAL NATURE STUDY
   A. Problems and Experiences
      1. To note effect of rains on nearby streams and their valleys.
   B. Suggested Activities
      1. Determine effect of rains on height of streams; on banks of streams.
      2. Discuss other changes in stream or banks noted.

XII. SEA SHELLS
   A. Problems and Experiences
      1. To learn to identify one or two types of water life that live in a shell with which pupils come in contact.
   B. Suggested Activities
      1. Make a collection of shells found in community if community is near a body of water. If above conditions exist in community try to obtain some shells in which the mollusk may be seen.
      2. Visit store in community in which oysters are received in the shell, if there is such a place, and ask to see some shells opened.
      3. Organize exhibition of beautiful shells lent by the children for the occasion. Label each shell with such descriptive material as children are able to obtain; as, where originally found, name if known.
      4. Learn how the chambered nautilus builds his house.
      5. Pupils examine picture of chambered nautilus.

Desirable: Stereographs of mollusks. Send for list to Keystone View Company, Meadville, Pennsylvania.

XIII. TREES
   A. Problems and Experiences
      1. To learn more about the propagation of trees.
      2. To extend identification of trees.
      3. To learn the duties of a forest ranger.
   B. Suggested Activities
      1. Pupils note what has happened to nuts planted previous Autumn. If results are not satisfactory determine probable reasons.
      2. Protect and care for young trees that have grown from these nuts.
      3. Identify six trees in Autumn dress. Look particularly for trees among those listed for Grades II-IV, Appendix.
      4. Identify four fruit trees as they appear in the Autumn. Look especially for Peach, Apple, Cherry, Plum trees.
      5. Determine the outstanding characteristic of non-poisonous Sumach trees (red-fruited).
      6. Find the duties of a Forest Ranger.
      7. Organize a Junior Forest Rangers Club.

8. Find what trees in the community, if any, are usually planted in the Autumn.
9. If trees are being planted in community, class as a whole or in groups assist in any of these plantings to which they may be invited.
10. Correlate work relating to trees with Autumn Arbor Day Program.

Helps For The Teacher In Evaluating Progress

1. Test each pupil on the identification of flowers, plants, and trees required for the Autumn. Remove weaknesses discovered.
2. Organize a true-false or multiple choice test on identification of birds that may commonly be seen in the community in the Autumn. Remove weaknesses disclosed.
3. Are your spider nests in good condition?
4. Are your pupils able to discriminate between beetles and other insects?
5. Are your pupils interested in the prevention and cure of garden diseases?
6. Are your pupils enjoying their Junior Forest Rangers Club? Are they feeling responsible for the care and preservation of trees? Is such a feeling a desirable character growth?
7. What evidence do you have that pupils appreciate the need for fishing seasons and fishing licenses?
8. Do pupils relate the length and direction of shadow of pole with position of sun?
9. Are pupils interested in Autumn rainfall as affecting Spring growth?
10. Organize tests covering essential facts for year thus far. Be sure that these tests are within the abilities of the child to interpret.
11. Did your Autumn Arbor Day Program add to the interest of the class in trees?

WINTER

I. SEASONS

A. Problems and Experiences

1. To learn meaning in terms of day and night of Winter Solstice.
2. To develop a greater sense of relationship between the length of day and night and the position of the sun.

B. Suggested Activities

1. Learn meaning of Winter Solstice in terms of length of day and night.
2. Note on globe position of Tropic of Capricorn, most Southern point at which sun ever appears exactly in zenith; Tropic of Cancer, most Northern point at which sun ever appears exactly in zenith.
3. Experiment with light and globe as at Autumn Equinox. Note effect on Northern part of the globe when light is over Tropic of Capricorn.
4. Note shortest day in year.
5. Mark length of shadow of pole on this day at same hour as for the Autumn Equinox. Compare length of shadow with length at the Autumn Equinox when day and night are equal.
6. Discuss effect upon comparative length of day and night when sun starts moving toward Tropic of Cancer.

II. SNOW

A. Problems and Experiences

1. To learn to measure depth of snowfall.

B. Suggested Activities

1. Review measurement of rainfall.
2. When there is a level snowstorm measure depth with ruler.
3. When the snow drifts, measure the depth of typical drifts; of deepest drifts. Estimate average depth of snowfall. Place snow to this depth in pan without disturbing natural packing. Melt. Find depth of water.
4. Place a pan in the open air when there is a level snowstorm. At close of storm measure depth of snow in pan. Measure depth of water when this snow melts. Compare depth of water obtained with depth of snow from which obtained.
5. Determine why snow is helpful in moistening the soil.

III. WEIGHT

A. Problems and Experiences

1. To learn to read weight scales.

B. Suggested Activities

1. Visit grocery or meat stores and observe how materials are weighed.
2. Pupils weigh articles until reasonable ease in doing this is attained.
3. Learn table of avoirdupois weight.
4. Pupils who have scales in homes report uses made of these scales.
5. If weight on home scales does not agree with weight registered at store discuss possibilities of inaccuracies in scales.
6. Correlate with civics: Inquire of grocer or other dealer in articles that are weighed as to examination of his scales by official inspectors.
7. Pupils learn to weigh themselves.

IV. RUBBER

A. Problems and Experiences

1. To explain process of vulcanization of rubber.

B. Suggested Activities

1. List some common uses of rubber.
2. Answer these questions:

   How would the elimination of vulcanized rubber from the world affect the automobile industry.

   What is done with the milky fluid from the rubber tree before it is fit for use as automobile tires and other hard rubber objects.
3. What is the meaning of the term vulcanization of rubber.
4. How did Goodyear discover the process of vulcanizing rubber?
5. Examine pictures illustrating the rubber industry.

Desirable: Film: Rubber. Commercial Museum, Philadelphia, Pennsylvania, Free.

V. ANIMALS, REPTILES, BATRACHIANS

A. Problems and Experiences

1. To continue the attempt to set up friendly relations with wild animals, reptiles or batrachians in neighborhood.
2. To study the life habits of the wolf.

B. Suggested Activities

1. Pupils continue to report personal experiences in gaining the friendship of harmless wild animals.
2. Teacher and pupils read or tell stories illustrating friendships between human beings and animals.
3. Examine pictures of wolves. Find foods, habits, and general characteristics.
4. Find relationship of the dog to the wolf.
5. Read or tell stories in which wolves are involved.

VI. AIR

A. Problems and Experiences

1. To learn that air is a real substance.

B. Suggested Activities

1. Force the mouth of a large empty water glass into a vessel of water until the bottom of the glass is under water. Push a piece of glass or other flat surface under the water and against the mouth of the water glass so that no water can escape while removing glass from vessel. Turn glass right side up and place on table. Note empty space at top of water in glass. Decide why the water did not fill the glass.

VII. FIRE

A. Problems and Experiences

1. To prove that fire will not burn without air.

B. Suggested Activities

1. Teacher light a small piece of rag on a plate or other non-inflamable material. Cover with sand or earth. Light another piece of rag and cover with a piece of heavy cloth. Note results in both cases.
2. Organize principle: Fire will not burn without air. Apply this principle to extinguishing fires.
3. Determine why fire burns more rapidly when there is a wind (air gets to more parts of fire).
4. Discuss danger of running when clothing catches fire. (Gives fire more air.)
5. Discuss best methods of procedure in case clothing of one's self or others catches fire.
6. Discuss reason fire in clothing may sometimes be beaten out by hand when area covered is small; dangers of method; why it should be used in an emergency only.

VIII. STARS

A. Problems and Experiences

1. To learn the difference between planets and sun stars.
2. To find Venus or other planets visible in the Western sky in the evening.
3. To find Cassiopeia's Chair.

B. Suggested Activities

1. Pupils discuss fact that some stars are lighted by the sun and that some stars are hot like the sun. If Venus is visible in the West in the evening find this planet as an example of a star that is lighted by the sun.
2. Note other planets visible in the evening with the naked eye, at time study is being made.
3. Find Cassiopeia's Chair. Note stars in Chair as example of sun stars.
4. Make picture showing moon and stars in the sky.

IX. COAL

A. Problems and Experiences

1. To find how coal was formed.
2. To determine the difference between anthracite and bituminous coal.

B. Suggested Activities

1. Find how coal was formed.
2. Explain why fossils are found in coal.
3. Collect samples of anthracite and bituminous coal. Explain principal differences.
4. Describe methods through which coal is separated into different sizes.
5. Build a miniature coal mine in an open box or in a corner of the room. Include typical situations and activities.
6. Pupils list questions with respect to the mining of coal that they would like to have answered.
7. Secure someone familiar with the above subject to come to the school and talk about the questions raised.

Desirable: Stereographs showing interiors of coal mines and methods of mining. See Catalog 28, p. 40-41, Keystone View Company, Meadville, Pennsylvania.

Stereoscopes of Fossil Forest. See Catalog 28, p. 76, Keystone View Company, Meadville, Pennsylvania.

X. MANUFACTURED AND NATURAL GAS

A. Problems and Experiences

1. To find how gas is manufactured.
2. To find meaning of "natural gas."

B. Suggested Activities

1. Class organize questions with respect to the manufacture of gas that they wish answered.
2. Make trip to community gas plant if within reasonable distance, or invite someone who is well acquainted with the subject to come to the classroom and talk about the subject to pupils.
3. Make trip to source of supply for natural gas if it is used in the community, if conveniently near.
4. Find how natural gas is formed.
5. Discuss method of distribution of gas to homes.

XI. SCIENCE IN THE HOME

A. Problems and Experiences

1. To determine how washing machines and wringers help in the work of the home.

B. Suggested Activities

1. Pupils give main points in methods through which washing machines in their homes clean the clothes; main points in the work of the wringer.

2. Decide how these helps make housekeeping easier.

XII. Ice

A. Problems and Experiences

1. To find common method for making artificial ice.

B. Suggested Activities

1. Review material respecting ice in previous grades.
2. Answer the following questions:
   Does ice freeze because the water "takes in" cold or gives off heat?
   Why do people sometimes put pails or tubs of water in a greenhouse or cellar to prevent freezing of plants or vegetables?
3. Pupils visit an artificial ice plant if there is one in the community and find how the heat in the water is extracted.

Desirable: Stereograph showing method of making artificial ice. See Catalog 28, p. 28, Keystone View Company, Meadville, Pennsylvania.

XIII. Transportation

A. Problems and Experiences

1. To determine whether or not roads in community are good ones.
2. To consider common methods for traveling.

B. Suggested Activities

1. Pupils discuss type of roads over which they prefer to ride.
2. Discuss extent to which such roads prevail in the community and near neighborhood.
3. Pupils note especially good pieces of roads over which they pass when riding in an automobile.
4. Discuss common methods for transportation of passengers and freight.

Desirable: Stereographs showing transportation in other countries, Catalog No. 28, Keystone View Company, Meadville, Pennsylvania, pp. 57-66.

XIV. Geological Nature Study

A. Problems and Experiences

1. To note how freezing and melting affects rocks and soils.

B. Suggested Activities

1. Observe effects of freezing and melting on rocks and soils.
2. Discuss changes in soils as a result of this breaking up; probable effect upon fertility.

XV. Animal and Insect Pests

A. Problems and Experiences

1. To find some methods for the prevention and elimination of household animal and insect pests that annoy man.

B. Suggested Activities

1. Pupils list some animal pests that like to live in homes and barns.
2. List household pests that eat food.
3. Emphasize importance of keeping all food covered.
4. Discuss methods for ridding house of rats and mice.
5. List insect pests that annoy human beings, such as fleas, lice, bed bugs.
6. Emphasize cleanliness as the great enemy of such pests.
7. Review material on flies, mosquitoes and other annoying or destructive insects.
8. Arrange for a talk to the class on the eradication of house and bodily pests by local druggist, or a nurse, or other person who has a knowledge of means for destroying such pests.
9. Discuss rapidity with which household pests increase.
10. Review experiment with flies in Grade III.
11. Make a study of the life history of one other household pest.
    The following is an example of such a study:

Establish a cage for the study of the common house roach: Procure a considerable number of roaches. Place them in a large glass receptacle. Cover top closely with wire or cloth netting. Place inside of cage a small shallow vessel to be used for water and a few small articles which will serve as a shelter for the roaches. Roaches will eat practically anything; dry bits of bread, bits of cooked meat, sour milk, in fact anything that may come from the kitchen will serve as food. After a colony has established itself in the cage keep on the lookout for a small brown elliptical body that will appear in the hindermost part of some of the insects. These insects are females and the brown bodies are egg baskets. The eggs are arranged in an orderly way. Soon after the capsules are dropped by the female they hatch and from them small roaches scamper. The whole life cycle of this insect takes about thirty or forty days in the schoolroom where the temperature is kept constant. It is important to clean out the cage from time to time and provide new food. The water supply should be constantly looked after.

XVI. Living Particles in the Air

A. Problems and Experiences

1. To find conditions favorable to growth of mold.
2. To find relation of mold to plant life.

B. Suggested Activities

1. Experiment: Place a piece of moist bread in a jar. Expose to the air for a few hours. Cover jar and watch mold develop.
2. Examine mold. Note that it resembles small plants.
3. Experiment: Place moldy bread in contact with bread free from mold. Observe mold form on fresh bread.
4. Discuss results of observation: That there are many invisible living particles in the air; that if these invisible particles fall upon bread they are likely to start growing; that a piece of fresh bread may "catch" mold from a piece of infected bread.
5. Consider how to prevent bread mold.
6. Test conclusion through experiment: Fill three or four jars that have tight covers with boiling water so as to kill mold spores that they may contain. Pour boiling water over knife and fork. Cut three or four slices of bread and with help of fork place one in each jar. Screw covers on tightly. Take three or

four other jars and without cleaning them place piece of bread, using hands, on the bottom of each jar. Set in damp place or dampen bread slightly. Do not cover. Note which slices of bread grow moldy first; discuss reasons.
7. Discuss mold in connection with other materials such as leather.
8. Discuss application of principles discovered to home care of bread.
9. Discuss why the doctor boils his instruments or otherwise thoroughly cleans them before using.

XVII. Flowers

A. Problems and Experiences
1. To extend identification of flowers.
2. To learn some remedies for enemies of house plants.

B. Suggested Activities
1. Pupils examine plants in their homes for insect infestations or plant diseases. Discuss effect of these upon the plant.
2. Visit greenhouse or florist. Find names of two kinds of Roses. Look for Maiden Hair Fern, Boston Fern, Fan Palms.
3. Identify six house or greenhouse plants. Look especially for six among those listed for Winter for Grades I-IV, Appendix.
4. Ask proprietor or attendant if he has trouble with insects or diseases that attack his plants. Find how he prevents or destroys these plant enemies. Apply to plants in homes that need treatment.

XVIII. Trees, Vines

A. Problems and Experiences
1. To extend identification of trees and vines.

B. Suggested Activities
1. Identify six trees as they appear in the Winter. Look especially for trees among those listed for Grades II-IV, Appendix.
2. Identify four fruit trees in Winter dress. Look particularly for Peach, Apple, Cherry, Plum trees.
3. Review identification of Ground Pine.
4. Determine similarities between Ground Pine and Evergreen trees.
5. Pupils report especially beautiful Hemlock trees that they have seen. Give some reasons for the choice of the Hemlock as the State tree.
6. Class or individuals compose a poem about the Hemlock tree.

XIX. Birds

A. Problems and Experiences
1. To extend knowledge of birds.
2. To build bird houses for use of birds in Spring and Summer.

B. Suggested Activities
1. Note birds identified in Autumn that remain in community during Winter.
2. Note Winter foods of such birds; where they sleep; how they protect themselves from the cold.
3. Try to help Winter birds to find food.
4. Try to find one bird that makes its home in neighborhood during the Winter only.
5. Find where this bird goes to make its nest.
6. Find kinds of birds that build nests in bird houses.
7. Discuss importance of fitting the house to the bird.
8. Pupils decide kind of birds for whom they wish to build houses.
9. Decide dimensions and size of entrance in houses for such birds (United States Department of Agriculture, Farmers Bulletin 1456 Homes for Birds).
10. When completed place bird houses in positions that are likely to be satisfactory to birds for whom houses are intended.
11. Continue Junior Audubon Club initiated in Grade III.

XX. Heredity

A. Problems and Experiences
1. To determine meaning of a pedigreed dog.

B. Suggested Activities
1. Discuss meaning of a "pedigreed dog."
2. Pupils who have pedigreed dogs give the history of the ancestors of these dogs so far as they know it.
3. Discuss reasons why a mongrel is not likely to receive a prize at a dog show.
4. Apply to pedigreed bulls and other animals.

XXI. Rot

A. Problems and Experiences
1. To note rot among fruits and vegetables.

B. Suggested Activities
1. Discuss prevention of rot.
2. Discuss rot of apples or other fruits or vegetables.
3. Discuss from where the beginning for the rot comes.
4. Review why the doctor boils his instruments before using them.
5. Experiment in presence of class:

Teacher heat the end of a wire red hot in gas flame or other hot flame and let it cool. Do not touch part of wire that has been heated or it must be heated and cooled again. Why? With the wire pupils make three small holes about one inch apart in the skin of a sound apple or other fruit. Touch end of the wire on spores of rotten fruit and work a little of the spore dust that sticks to it into two of the holes in the fruit. Examine twice a day without handling. Note differences that may develop in holes. It is important to remember that rot can be spread by wind, by the hands, or by contact with fruit afflicted with rot, and that injury is favorable to the development of rot.

6. Carry on similar experiment with potatoes.
7. If pupils have apple cellars in their homes or if they have access to apple cellars or other methods for storing apples the following investigation may be made: Count out 100, 500, or 1000 apples in the cellar, taking them as they come. Count the rotten fruit in this number. Decide about what fraction of the total number counted is rotten? (Teacher help in

this. Use easy approximations. About how many bushels of apples in the cellar? On a basis of this estimate number bushels of rotten apples)

8. Decide why a storage place for fruit should be thoroughly cleaned and washed or whitewashed each season before filling with fruit.

XXII. Fowls

A. Problems and Experiences
1. To determine why eggs and chickens are so widely used as foods.
2. To find breeds of hens that are good egg layers; breeds of chickens that are especially desirable for their meat.

B. Suggested Activities
1. Suggest means through which the number of eggs laid by each hen in a flock may be determined.
2. Make trips to markets for purpose of finding what breeds of chickens are preferred for food.
3. Make trips to grocery stores for purpose of finding what breeds of eggs are preferred.
4. Discuss other breeds of chickens that pupils consider especially desirable as egg producers or meat producers.
5. Make trips to nearby chicken farms for purpose of observing different breeds of chickens. Observe methods for hatching chickens.
6. Define meaning of the term "pure bred poultry."
7. Discuss meaning of "milk-fed chickens" and why a higher price is paid for such chickens.
8. If a number of pupils in the class are interested in the production of eggs organize an egg laying contest.

Note: Information respecting regulations for the Pennsylvania Official Egg Laying Contest may be obtained by Superintendents and Supervisors from the State Department of Agriculture, Harrisburg.

XXIII. Foods

A. Problems and Experiences
1. To find why foods are cooked.

B. Suggested Activities
1. Review preservation of foods through cooking.
2. Discuss other reasons for cooking foods.
3. If available teacher read to class that part of Charles Lamb's *A Dissertation Upon Roast Pig,* that tells how the deliciousness of roasted pig was discovered: Among other sources this may be found in Essays of Elia, published by Artemus, Philadelphia; Macmillan, New York; Nelson, New York.

XXIV. Insects and Arachnids

A. Problems and Experiences
1. To consider developments in spider egg nests.
2. To consider developments, if any, in potato beetle nest.
3. To consider changes, if any, in butterfly and moth pupae in classroom.
4. To extend identification of insects and arachnids.

B. Suggested Activities
1. Pupils discuss developments, if any, in spider egg nests established in Autumn; in potato beetle nest.
2. In early Spring plant potatoes in soil in potato beetle's nest. Note beetles comes out of ground when the stalks begin to grow. Note eggs. Note laying of eggs and metamorphosis into adult beetles.
3. Note changes in butterfly and moth pupae in classroom.
4. Compare condition of such pupae in classroom with similar pupae that have remained outdoors during the Winter. Continue this comparison during Spring and Summer.
5. Compare emerging moths and butterflies with pictures of the Monarch Butterfly, the Cecropia Moth, the Promethea Moth. Note if any of these butterflies or moths have emerged.
6. Try to identify moths and butterflies other than those mentioned that emerge from classroom chrysalises and cocoons.

Helps For The Teacher In Evaluating Progress

1. Were children interested in the differences in length of day and night at the Autumn Equinox and at the Winter Solstice?
2. Test each pupil in the class on his ability to read weight scales; on his knowledge of the table of avoirdupois weight.
3. Did the study of rubber add to the pupil's consciousness of the interdependence and inter-relations of peoples?
4. Are your pupils conscious of air as a real substance? That fire will not burn without air?
5. Were your pupils able to locate a planet? Cassiopeias Chair?
6. Was the building of a miniature coal mine an interesting unit of work?
7. Were the learning products resulting from the study of the roach or substituted insect worth while?
8. Are the pupils in the class showing an increased desire for house plants in their homes? A practical attitude toward the care of such plants?
9. Have your pupils completed their bird houses and put them up?
10. Are your pupils interested in mold and rot as caused by contacts or living particles in the air.
11. What practical values have resulted from the experiments with mold and rot?
12. Did the consideration of the meaning of a pedigreed dog add to the growth of a concept of the meaning of heredity?
13. Have your spider nests been interesting thus far?
14. Organize a true-false, completion, or other test covering points that you consider most important for the year thus far.
15. Remove weaknesses that these tests may disclose.

SPRING AND SUMMER

I. Seasons

A. Problems and Experiences
1. To learn why we have Autumn, Winter, Spring and Summer in Pennsylvania.
2. To learn why leaves and flowers appear earlier in the Southern part of Pennsylvania than in the Northern part.

B. Suggested Activities
1. Review reasons for changes in the length and direction of shadow cast by rod as seasons change.

2. Note Spring Equinox (see dictionary).
3. Experiment with light and globe as at Autumn Equinox. Show that sun has moved back to position over Equator. Determine how sun's continued movement toward the Tropic of Cancer will affect the length of day and night.
4. Define terms: Earth's Equator, Tropic of Cancer, Tropic of Capricorn, Arctic Circle, Antarctic Circle, in relation to sun.
5. Compare climate in Florida with climate in home town. Illustrate reasons for this with globe and light.
6. Determine reasons for blossoming of flowers in Philadelphia earlier than in locations farther North.
7. Pupils who have an opportunity to observe this, report blossoming of flowers in advance of home community. Give reasons for this.
8. Discuss advantages of Temperate Zone.
9. Compare length of shadow at Spring Equinox with length of shadow at Autumn Equinox.

II. SOIL

A. Problems and Experiences

1. To determine value of leaf decay in making soil.
2. To determine how rocks help to make soil.

B. Suggested Activities

1. Note appearance of leaves on ground; dark spots caused by mold. Note differences that seem to indicate different types of leaf decay.
2. Discuss effect of decayed leaves on soil.
3. Note how deep the leaf mold extends where excavations are being made.
4. Ask florist or farmer if he thinks decayed leaves are of value in making good soil.
5. Note soil and stones near rocks. Decide whether or not soil and stones were formed from the rocks; Discuss different ways in which rock was probably broken up, as rain, freezing and melting, streams of water. (Gerald Craig, Tentative Course in Elementary Science for Grades III and IV, p. 109)
6. Pupils examine picture of rocks that have been worn out by natural forces, as Natural Bridge, Virginia; Canyon of the Colorado.

Desirable: Stereographs showing Natural Bridge of Virginia, Canyon of the Colorado, and other erosions made by water and wind. See Catalog 28, p. 71. Keystone View Company, Meadville, Pennsylvania.

III. SNAKES

A. Problems and Experiences

1. To learn that most snakes are harmless.
2. To learn how snakes help man.

B. Suggested Activities

1. Place garter snakes or other harmless snakes in aquarium. (Gerald Craig, Tentative Course of Study in Elementary Science, Grades I and II, p. 24)
2. Give each snake a name as Tom, Dick, Harry. (This will add interest and help pupils to be specific in describing the activities of each snake in the aquarium.)
3. Place various foods in cage with snakes and note what they eat and what they reject. Provide each snake with foods that he likes.
4. Each pupil write a story about one of these snakes.
5. Examine pictures of the milk snake or spotted adder.
6. Find why this snake is sometimes found in barns? (Does not milk cows; could not do this; frequents barns because it is an inveterate hunter of rats and mice.)
7. Find difference in propagation of garter snake and milk snake (garter snakes are born alive and mother stays with them for some time. The milk snake lays eggs which hatch in about two months.)

IV. SEEDS AND BULBS

A. Problems and Experiences

1. To determine success of growth of plants planted in Autumn.
2. To determine importance of good seeds.
3. To learn that plants grow from seeds, tubers, bulbs and corms.

B. Suggested Activities

1. Discuss reasons for superior and inferior growths of plants planted in Autumn.
2. Note earliest blossoms in each type of plant.
3. Discuss possible reasons for this plant blossoming earlier than the others.
4. If sufficiently successful invite another class or the parents and friends of pupils to see plants in bloom.
5. Examine potato, onion, and bean and determine point of propagation in each.
6. Discuss relation of a potato planted to the type of crop secured. Apply to other types of seeds.
7. Plant on blotting paper in tumblers or other dishes, pumpkin, squash or other seeds as taken from the package.
8. Note number of seeds of each kind planted.
9. Note number of seeds of each kind that sprout; number of plants that are particularly strong; that are weak.
10. Apply findings to value of seeds used.

V. FISH

A. Problems and Experiences

1. To study spawning of fish.

B. Suggested Activities

1. Find how fish propagate (eggs laid by mother fish; father fish pours over eggs a fluid from his body that helps them to hatch.)
2. Place fish spawn in aquarium.
3. Observe hatching.
4. Define forage fish.
(State Board of Fish Commissioners, Bul. 4, A Treatise on the Fish of Pennsylvania, p. 25.)

VI. ANIMALS, REPTILES, BATRACHIANS

A. Problems and Experiences

1. To continue effort to set up friendly relations with wild animals, reptiles or batrachians found in neighborhood.

B. Suggested Activities

1. Pupils continue to tell stories of results of their efforts to set up friendly relations with individuals among harmless types of wild life.

VII. FOSSILS

A. Problems and Experiences

1. To extend knowledge of fossils.

B. Suggested Activities

1. Discuss origin of fossils. (See Grade III)
2. Bring to school fossils found in neighborhood, if any are found. (George Ashley, The Rocks of Pennsylvania and the Stories They Tell, Pennsylvania School Journal, January 1928, p. 303)
3. Add fossils obtained from homes and various sources.
4. Organize an exhibit of fossils to which guests are invited.

VIII. INSECTS

A. Problems and Experiences

1. To extend knowledge of butterflies and moths.

B. Suggested Activities

1. Organize a butterfly and moth chart. Enter names of a minimum of five butterflies or moths observed, with drawing or description of each, date at which observed and where. Include the Cecropia Moth and the Roadside Butterfly if these are noted.

IX. TREES, VINES

A. Problems and Experiences

1. To extend indentification of trees and vines.
2. To extend knowledge of how trees propagate.

B. Suggested Activities

1. Identify six trees as they appear in the Spring and Summer. Look especially for trees among those listed for Grades II-IV, Appendix.
2. Identify four fruit trees in their Spring and Summer dress. Look especially for Peach, Apple, Cherry, Plum trees.
3. Note flowers on Oak tree. Determine relation of flowers to acorns.
4. Note flowers and seeds on Elm tree.
5. List various ways in which seeds and nuts may be carried far from the trees upon which they grow. (Wind, birds, man; carried away and buried in ground by certain animals).
6. Determine reasons for growth of young Maple tree or other trees near a large tree of the same kind.
7. Note blossoms on Horse Chestnut tree. Discuss relation of blossoms to chestnut.
8. Find how many leaves form a group on the Poison Ivy; on the Virginia Creeper.
9. Discriminate between Poison Ivy and Virginia Creeper and other vines.
10. Determine why the following sayings are wise ones:

    "Leaflets three;
    Let it be."

    "Leaflets three;
    From me flee."

    "Five fingers may handle five leaves."
11. Correlate study of unit with Spring Arbor Day Program.
12. Plant a White Birch tree in connection with the Mother's Day school program or choose an especially beautiful White Birch in the neighborhood and dedicate it to the mothers of the class. (See Grade III)

X. BIRDS

A. Problems and Experiences

1. To determine birds in neighborhood that are especially helpful to crops.
2. To extend identification of birds.

B. Suggested Activities

1. Note if birds are building nests in bird houses that class has built and set up. If any of these houses remain unused try to find reason for this.
2. Note birds identified in Autumn that nest in community.
3. Note at least three birds that remain in neighborhood during Spring and Summer only; at least one bird that is a permanent resident.
4. Class make trips for purpose of observing how birds build their nests.
5. Each pupil choose for observation a pair of birds who are building a nest. If bird nests are scarce in the community, a number of pupils may observe the same nest.
6. Discuss need for quiet when observing the activities of birds.
7. Each pupil keep a diary for the birds that he is observing, covering the period from the beginning of nest building to the time when the young birds fly away. Include in this diary the foods the parents eat and the foods they bring to their young.
8. Decide from food they eat whether these birds help man or are seriously injurious to crops.
9. Note frequent differences between the coloring of the male and the female bird.
10. Decide whether or not birds are good parents.
11. Correlate material on birds for the year with a Bird Day Program.

XI. FRUITS AND BERRIES

A. Problems and Experiences

1. To extend acquaintance with fruits and berries that grow in the neighborhood.
2. To learn how the common berries propagate.

B. Suggested Activities

1. Note four fruit trees as they blossom.
2. Make a chart indicating date of blossoming and approximate date when fruit will be ready for use.
3. Make similar chart for berries or combine orchard trees and berries in one chart.

4. Find how long before crop may be expected from the planting of the seeds of the Strawberry, Raspberry, and other berry vines or bushes.
5. Find most common method for propagating Strawberries; other berries with which class is familiar.
6. If members of class have berry runners or cuttings to give to members of class who do not have such berries in their gardens, class help such pupils to determine best methods of procedure in planting.

XII. Flowers, Vegetables, Home and School Gardens

A. Problems and Experiences

1. To determine reasons for laws respecting the preservation of wild flowers.
2. To extend identification of such flowers.
3. To extend identification of common garden flowers.
4. To extend experiences in the planting and raising of flowers and vegetables.

B. Suggested Activities

1. Review materials in Grades II-III respecting wild flowers.
2. Note attractive wild shrubs and trees in neighborhood or when driving in other localities.
3. List reasons why these shrubs and trees should not be injured or destroyed.
4. Discuss reasons for laws that set up fines and punishment in the case of people who wilfully injure or destroy wild flowers, shrubs, and trees. (For these laws see Laws of Pennsylvania, 1925, Act 184 and Act 259.)
5. How can law abiding citizens help to enforce these laws?
6. Identify six wild flowers that bloom in the Spring and Summer. Look especially for flowers among those listed for Grades I-IV, Appendix.
7. Determine what ones of the flowers identified, if any, should not be picked.
8. Make pictures of three wild flowers that should be protected.
9. If wild flowers that should be conserved are found in places where they are likely to be injured or destroyed, pupils place wire around plot or otherwise provide for their protection.
10. Send list of wild flowers that should not be picked to homes if duplicator is available or ask local press to publish this list. (See Appendix)
11. Organize the class into a "Save the Wild Flowers Club." Address Mrs. A. R. Iliss, Secretary, Pennsylvania Chapter Wild Flower Preservation Society of America, Homestead, Ambler, Pennsylvania.
12. Pupils make "Save the Wild Flowers" posters.
13. Pupils make "Save the Wild Flowers" badges for themselves and for their parents and neighbors.
14. Identify ten garden flowers that bloom in Spring or Summer. Look especially for flowers among those listed for Grade I-IV, Appendix.
15. Note annuals, biennials, perennials.
16. Discuss condition of Iris planted in Autumn.
17. Discuss methods for Aster planting so as to secure successful blooms.

Note: Perhaps a local Garden Club will help to provide school with Aster seeds and will sponsor exhibit.

18. Plant Aster seeds in home gardens for exhibition of Asters in Autumn of Grade V.
19. In late Winter or early Spring plant cabbage seeds after choosing variety. Transplant before close of school to home and school gardens.

Helps For The Teacher In Evaluating Progress

1. Do your pupils have a satisfactory understanding of the reasons for the seasons within the limits of the abilities of children of this age? Do they realize the importance of good seeds?

2. Did any of your pupils secure the friendship of a harmless wild animal. Was trying to do this profitable?

3. Do you consider the home and school garden situation satisfactory? If these are not satisfactory what might have been done to improve the situation?

4. Organize tests covering identifications suggested.

5. Were any fruits or berries added to the gardens of your pupils? What character traits are practiced by the givers and the receivers in cases in which pupils who have extra plants give them to pupils who do not have such plants and who would like them?

6. Have pupils some conception of the tremendous lighting power of the sun? Of the sun as the source of light for the earth?

7. Have pupils a knowledge of the ways in which coal beds were formed? Of the ways in which natural gas has been formed? Of the way in which gas is manufactured?

8. Are you satisfied with the conduct of your class on the school journeys that they have made? Have your pupils practiced desirable characteristics on such trips?

9. How would you rate the development of the class during the year on the growth of scientific knowledge and attitudes? On the growth of character attributes as a whole?

10. Organize tests covering most important points in the years work.

11. Were you able to get material respecting the conservation of wild flowers before the public?

12. Organize test covering essential points studied in the Spring and Summer; in the entire year.

References

Comstock, Anna. Handbook of Nature Study

Craig, Gerald, Tentative Course of Study in Elementary Science for Grades I and II: Grades III and IV; Grades V and VI

Craig & Hurley, Pathways in Science, Book IV, The Earth and Living Things

Downing, E. R., Our Living World

Downing, E. R., Our Physical World

DuPuy, William Atherton, Our Insect Friends and Foes

DuPuy, William Atherton, Our Animal Friends and Foes

DuPuy, William Atherton, Our Bird Friends and Foes

DuPuy, William Atherton, Our Plant Friends and Foes

Gehrs, John, Agricultural Nature Study, Book I

Green, George, A Survey of Nature

Gress, Ernest, Common Wild Flowers of Pennsylvania

Illick, Joseph, Common Trees of Pennsylvania

Medsger, Oliver, Nature Rambles-Spring

Mooney, James E., Air Travel

National Geographic Society, Washington, D. C., Colored Pictures of Animals, Flowers, Fish

Pennsylvania State College, Circular 140, Fly Protection

Perry Picture Company, Malden, Mass., Pictures of Birds

Persing & Wildman, Elementary Science by Grades, Book IV

State Board of Fish Commissioners, Bul. 4, A Treatise on the Fish of Pennsylvania

State Board of Game Commissioners, Educational Leaflet No. 1, Descriptive Stories of Pennsylvania's Game and Fur Bearing Animals

State Board of Game Commissioners, Bul. 9, A Year's Program for Bird Protection in Pennsylvania

State Board of Game Commissioners, Bul. 10, Game Administration in Pennsylvania

State Board of Game Commissioners, Bul. 11, More Food for Upland Game

State Department of Agriculture, Bul. 489, Mexican Bean Beetle in Pennsylvania

State Department of Agriculture, Bul. 473, The Japanese Beetle in Pennsylvania

State Department of Agriculture, Bul. 508, Preservation of Wild Flowers

State Department of Internal Affairs, Bul. G-3, Pennsylvania Caves

Sutton, George, Birds of Pennsylvania

Ullrich, F. T., Our Farm World

United States Department of Agriculture, The Colorado Potato Beetle

United States Department of Agriculture, Bul. 1371, Diseases and Insects of Garden Vegetables

United States Department of Agriculture, Farmers Bul. 1456, Homes for Birds

United States Department of Agriculture, Bul. 1591, Transplanting Trees and Shrubs

United States Department of Agriculture, Misc. Circular 98, The Forest, a Handbook for Teachers

GRADE FIVE

AUTUMN

I. PLANTS, FLOWERS
  A. Problems and Experiences
    1. To extend identification of plants and flowers.
    2. To consider results of flower plantings in the Spring.
    3. To start plants for Winter and Spring blossoming.
  B. Suggested Activities
    1. Discuss results of flowers planted previous Spring.
    2. Determine reasons for sucesses and failures.
    3. Pupils describe successful flower gardens at their homes. Pupils visit these gardens.
    4. Discriminate between Aster and Dahlia.
    5. Organize Aster show. Secure committee of parents or others to act as judges. Award ribbon or card for different colors, for arrangement and for other features.
    6. Identify fourteen garden flowers. Look especially for flowers among those listed for Autumn for Grades I-V, Appendix.
    7. Class or individuals choose one flower that blooms in the Autumn for special study. Find whether it is a native plant or an imported plant; type of soil and conditions under which it grows best.
    8. Identify four wild flowers. Look especially for wild flowers among those listed for Autumn, Grades II-V, Appendix.
    9. Plant bulbs and roots for Spring blossoming.

II. GARDEN DISEASES
  A. Problems and Experiences
    1. To identify the most common garden diseases in neighborhood.
    2. To determine means for prevention and elimination of such diseases.
  B. Suggested Activities
    1. Review previous work respecting garden and fruit diseases.
    2. Place portion of diseased garden plants in closely covered fruit jar.
    3. Discuss effects of these diseases.
    4. Find names of at least three of these diseases with methods for prevention and eradication.

III. BIRDS
  A. Problems and Experiences
    1. To extend study of birds.
  B. Suggested Activities
    1. Identify nine birds observed in community in Autumn. Look particularly for birds among those listed for Grades I-V, Appendix.
    2. Note Autumn foods of birds identified.
    3. Try to find abandoned nests of at least four species of birds. Attach name of bird on each nest.
    4. Review material in previous grades respecting migration of birds.
    5. Class or individuals choose for special study a bird passing through community on way to point farther South. Find where this bird builds its nest and rears its young; where it spends the Winter months; about when it will pass through community in Spring.

IV. INSECTS AND ARACHNIDS
  A. Problems and Experiences
    1. To extend identification of butterflies and moths.
    2. To extend identification of spiders.
  B. Suggested Activities
    1. Observe the Crab Spider and the Jumping Spider.
    2. Find some facts in the life history of these spiders.
    3. Make pictures of these spiders.
    4. Note butterflies and moths previously identified. Add others.
    5. Find caterpillars of the Isabella Tiger Moth, usually called the Wooly Bear.
    6. Place several in ventilated boxes.. Keep boxes outdoors and observe changes. (Probably will not make cocoons until April or May. The moth emerges about a month later.)
    7. If moths have not emerged before close of school permit pupils to take boxes containing cocoons to their homes.

V. SNAKES
  A. Problems and Experiences
    1. To continue a study of the snake.
  B. Suggested Activities
    1. Compare hatching of snake eggs with hatching of bird's eggs. (In a few species of snakes the young are born alive.)
    2. Examine pictures of Boa Constrictor.
    3. Find whether the bite of the Boa Constrictor is poisonous or non-poisonous; in what way it is dangerous.
    4. Place harmless snakes in aquarium for Winter observation. Provide natural situation with earth floor and brush and other materials under which snakes may retire.
    5. Observe activities of these snakes.

VI. TREES, BUSHES, VINES
  A. Problems and Experiences
    1. To extend knowledge of trees, bushes, and vines.
  B. Suggested Activities
    1. Note condition of trees planted in Grade III.

2. Note appearance of Poison Ivy, Virginia Creeper and other vines in Autumn coloring.
3. Class choose most beautiful Autumn flowering bushes growing in neighborhood. Find names of these bushes. Learn how these bushes propagate.
4. Make plans for planting bushes in home or school yards at the proper season.
5. Note acorns on Oak trees. Connect with flowers observed on Oak tree in Spring of Grade IV. Discriminate between White Oak and Red Oak.
6. Identify ten trees in Autumn dress. Look especially for trees among those listed for Grades II-V, Appendix.
7. Identify the following fruit trees as they appear in the Autumn: Peach, Apple, Cherry, Plum, Pear tree.
8. List some trees that grow from nuts; from seeds.
9. Plant Apple seeds in home and school gardens.
10. Correlate unit with Autumn Arbor Day.

VII. Fruits and Vegetables

A. Problems and Experiences

1. To appreciate the beauty of fruits and vegetables.

B. Suggested Activities

1. Pupils study pictures of fruits and vegetables.
2. Class arrange fruit and vegetable pictures, either as individuals or groups. Pictures may be prepared as follows: Teacher assign each individual or group planning to make a picture a portion of a table or shelf or of the floor if no table or shelf is available. Each pupil or group arrange in space assigned, fruits or vegetables or combinations of both so as to make a beautiful display. If desired, colored paper or cloth may be placed beneath the fruit. Pupils choose committees from class to act as judges and to designate the best groups on a basis of previously determined standards; for example, the three best groups of fruits and vegetables combined; of fruits only; of vegetables only; best three groups in shades of one color; in variegated colors.
3. Pupils paint pictures of some of these groups.

VIII. Game Birds, Animals, Fish

A. Problems and Experiences

1. To find why the bat is called a mammal.
2. To list principal game birds in State.
3. To find principal foods of each species.
4. To extend knowledge of fish.
5. To find why hunting and fishing are regulated by law.

B. Suggested Activities

1. Pupils discuss meaning of game birds and animals.
2. Pupils note game animals and birds if they have an opportunity to see any such. Note especially the deer and bear.
3. Pupils discuss value of game animals and birds to early pioneers.
4. List most important game animals in the State.
5. Note season for hunting these animals and birds.
6. Determine why the seasons for hunting game animals and birds are short; why licenses to hunt game animals and birds are necessary under the law; how and by whom these licenses may be obtained.
7. Identify Yellow Perch. Find open season for Yellow Perch.
8. Discuss reasons for law limiting catch of Yellow Perch to twenty-five by a person in one day.
9. Discuss meaning of a good sportsman in relation to game birds, fish, and animals. (State Board of Game Commissioners, Harrisburg, Bul. 10, Game Administration in Pennsylvania.)
10. Find principal points in the life history of the bat; why the bat is a mammal; how the bat helps man.

Desirable: Film on Wild Life Conservation in Pennsylvania; State Board of Censors, Harrisburg. Free.

IX. Seasons

A. Problems and Experiences

1. To compare seasons in Pennsylvania with seasons the same number of degrees south of Equator.

B. Suggested Activities

1. Find on map location about as far South of the Equator as Pennsylvania is North of the Equator.
2. With light and globe or other objects, show position of sun in relation to earth at the time of the shortest day of the year in Pennsylvania; at the time of the longest day of the year; Note difference of relation of earth to sun on these days in the lands South of the Equator.
3. Apply to opposites in seasons.
4. Class or individuals choose place South of the Equator to which a person who wished to live in a climate similar to a Pennsylvania Summer all of the year might go during the Winter.

X. Seeds

A. Problems and Experiences

1. To test the fertility of corn ears.
2. To appreciate the importance of good seed.

B. Suggested Activities

1. Carry out the following experiment: Fill shallow pan or box with sand or earth. Secure piece of thin cheesecloth the size of pan. Divide into two-inch squares with a heavy pencil. Number each square with indelible pencil. Place over sand. Secure an ear of corn for each square. Firmly attach a number to each ear of corn corresponding to a number on the piece of cheesecloth. Take five or six kernels from ear of corn and drop on square with corresponding number. Keep sand moist and watch germination.
2. Pupils answer this question: What ears of corn in the collection used above would you prefer to use for planting?

XI. HEREDITY

A. Problems and Experiences

1. To determine meaning of term "blooded horse"; why prize winning horses so frequently have superior horses among their ancestors.

B. Suggested Activities

1. Review material in earlier grades respecting heredity.
2. Discuss meaning of the term "blooded horse".
3. Find names of prize winning horses at the county fair or other events, if there are any such. If available, secure lists of prize winning ancestors or descendants of these horses.

Helps For The Teacher In Evaluating Progress

1. Did most of the class enter flowers in the Aster show?
2. Are your pupils able to identify the suggested number of birds?
3. Make a list of birds that the different pupils in the class can identify. Ask each pupil to prove that he can identify nine of these birds by making a picture of the bird opposite its name or listing the outstanding characteristics in its appearance.
4. Can your pupils discriminate between Poison Ivy and other vines?
5. Were the pupils interested in the fruit and vegetable pictures?
6. Do your pupils understand reasons for shortest and longest days in the year in terms of distance of path of sun from Zenith?
7. Organize a completion test covering these two points.
8. Help pupils who fail.

WINTER

I. ORCHARD DISEASES AND INSECT PESTS

A. Problems and Experiences

1. To continue the study of orchard diseases.
2. To find how the Coddling Moth injures the apple.
3. To find how to reduce damage from this pest.

B. Suggested Activities

1. Examine apples for signs of apple rust. Give reasons for such condition.
2. Determine why the Red Cedar is called a host plant for apple rust.
3. Try to find samples of apple rust gall on Red Cedars if there are any nearby.
4. Answer this question: What would happen to apple rust if no Red Cedars were permitted to grow near apple orchards?
5. Place apples containing Coddling Moth larvae (usually called apple worms) in glass jar. Place two or three pieces of corrugated paper inside jar against sides. Tie mosquito netting or thin cloth over mouth of jar. Apples used may be cut open and larvae examined and apple put together again with tooth picks or tied with cord. When larvae emerges from apple it usually seeks the corrugated paper and spins a cocoon. After cocoon is spun place jar in a cold place for two weeks. If there is frost so much the better. Return jar to classroom. If the air in the classroom is too dry for good health the moth will have crippled wings when it emerges. In a classroom temperature the Coddling Moth will emerge from the cocoon in a relatively short time, probably before Christmas.
6. Try to find cocoons of the Coddling Moth on the trunks of Apple trees. (Difficult to find because of highly protective coloring.)
7. Find means employed to rid orchards of the Coddling Moth.

II. FOREST CONSERVATION

A. Problems and Experiences

1. To learn meaning of the term "trees as a renewable crop".

B. Suggested Activities

1. Discuss meaning of term "trees as a renewable crop".
2. Continue Junior Forest Rangers Club, established in Grade IV.
3. Pupils report vacant tracts of land of which they know, that probably would produce good timber if planted with trees.
4. Find how the State helps individuals to plant trees; how vacant land may be made profitable in this way.
5. Correlate unit with Spring Arbor Day.

III. BIRDS

A. Problems and Experiences

1. To extend knowledge of birds.
2. To help birds to find food in the Winter.

B. Suggested Activities

1. Note birds identified in Autumn that remain in community during Winter.
2. Note Winter foods of such birds; where they sleep, how they protect themselves from the cold.
3. Try to find two birds that make their homes in neighborhood during the Winter only.
4. Find where these birds go to make their nests.
5. Make a food shelf or table where foods may be placed for Winter birds.
6. Observe birds that come to this table to eat.
7. Make pictures of these birds.

IV. GOOD ROADS

A. Problems and Experiences

1. To find some ways in which the state helps to keep roads safe and in good order.

B. Suggested Activities

1. Discuss relation of good roads to safe transportation; to possibilities of visits with friends; to visits to points where the scenery is especially beautiful.
2. Determine why there are white posts or other white marks along state highways.
3. Find how the state helps to make its roads safe in the Winter.
4. Find what fuel is used in snow plows. Examine pictures of snow plows clearing the roads if these may be obtained.
5. Make picture of snowplow in action if this is observed.

V. THE PLUMB LINE
- A. Problems and Experiences
    - 1. To determine use of the plumb line.
- B. Suggested Activities
    - 1. Decide whether or not the carpenter considers it important to make the walls of rooms and buildings straight.
    - 2. Find how the carpenter makes certain that his lines are straight.
    - 3. Fill a small bottle about two-thirds with water; tie knot on cord so it will hold on bottom of cork and run cord through center of cork. Press cork into bottle. Fasten cord to hook or other convenient projection. Note if water in bottle is level. (Uneven water line indicates that the line may not be plumb.) Apply use of such an instrument to house building.
    - 4. Discuss reasons why this bottle and line may not tell the exact truth, as cord may not run through exact center of cork, bottle may not be equally heavy in all parts.
    - 5. If available, secure a commercial plumb such as is used by carpenters and follow directions for securing a plumb line.
    - 6. Decide why a line made with this plumb is likely to be more reliable than a line made with help of water in a bottle.

VI. YEAST
- A. Problems and Experiences
    - 1. To find conditions favorable to the fermentation of yeast.
    - 2. To find relation of yeast to plant life.
- B. Suggested Activities
    - 1. Review results of experiment with bread mold.
    - 2. Carry on an experiment with helpful living particles such as yeast cake. Obtain a cake of yeast. Powder between fingers and note fine particles that may be blown into air. Place cake of yeast in mixture of water and flour and note fermentation.
    - 3. Pupils learn that yeast cakes are made of living particles that have been dried and pressed into cakes by their manufacturers; that these living particles grow especially well in a mixture of flour and water and make the dough light.

VII. FLOWERS
- A. Problems and Experiences
    - 1. To extend identification of flowers.
    - 2. To learn how and where Orchids naturally bloom.
- B. Suggested Activities
    - 1. Learn to recognize the Orchid; find how and where it naturally blooms.
    - 2. Identify eight house or greenhouse plants or flowers. Look especially for plants and flowers among those listed for Winter for Grades I-V, Appendix.

VIII. AIR
- A. Problems and Experiences
    - 1. To learn that air has weight and force.
    - 2. To learn that air may be compressed.
- B. Suggested Activities
    - 1. Review experiment respecting air in Grade IV.
    - 2. Obtain paper bag. Open and lay on desk or table. Discuss air in bag in relation to surrounding air. (Same amount per volume.)
    - 3. Blow air into bag. Note extension of sides. Discuss reason for this. (Quantity of air forced into bag in addition to that already there.)
    - 4. Note hardness of bag. Break bag with a blow.
    - 5. Determine why the bag broke; reason for loud noise when bag broke.
    - 6. Compare a flat automobile tire with paper bag before additional air is forced into it; a ''blowout'' with breaking of paper bag when filled with air.
    - 7. Discuss remedy for a flat automobile tire.
    - 8. Weigh a flat automobile tire, basketball, or football. Force air into object and weigh again. Note that there is a difference in weight.
    - 9. Decide what this difference in weight represents. (Additional air forced into tire, basketball, or football.)
    - 10. Find how the man at the garage knows when he has pumped enough air into a tire.
    - 11. What is meant by charged water.
    - 12. Determine why the tank in which compressed air is kept must be strong.

IX. FIRE
- A. Problems and Experiences
    - 1. To learn methods of securing fire.
    - 2. To determine need for care in handling highly inflammable materials.
- B. Suggested Activities
    - 1. Discuss early methods of securing fire; today's methods of securing fire.
    - 2. Compare use of match with securing fire by friction. (Same principle. Match end is covered with materials that ignite quickly when rubbed against another piece of material.)
    - 3. Discuss principle and advantages of safety match. (End of match covered with materials that ignite quickly only if rubbed against certain other materials.)
    - 4. Discuss handling of materials that are highly inflammable as kerosene, gasoline, cleaning fluids.
    - 5. Experiment: Partly fill dish with water. Pour in small amount of oil. Note that oil spreads over entire surface. Apply this fact to attempts to extinguish flaming oil with water.
    - 6. Organize best procedure in case of fire from gasoline or other highly inflammable materials.

X. GASOLINE ENGINE
- A. Problems and Experiences
    - 1. To find important uses of the gasoline engine.
- B. Suggested Activities
    - 1. Pupils consider various fuels used in producing power in factories and other places.
    - 2. Discuss disadvantages of wood or coal as fuel for automobiles and aeroplanes.

3. Find how gasoline is made.
4. Note space between wick of lighted candle and flame. Explain this.
5. Find what happens to the gasoline in a gasoline engine before it ignites.
6. Discuss advantages of this fact with respect to the automobile and the airplane.
7. List important uses of gasoline engine.
8. Discuss the relation of the gasoline engine to the development of the automobile, the airplane, and the dirigible.

XI. WHY OBJECTS SINK OR FLOAT IN WATER
- A. Problems and Experiences
  1. To find under what conditions an object sinks in water; floats in water.
- B. Suggested Activities
  1. Review material respecting weight.
  2. In pan or tub of water experiment with floating and sinking of various objects as pebbles, small stones, bits of wood, pins, piece of iron or steel.
  3. Place pan or box in tub of water so that it will sink uniformly. Take out of water and mark water line with pencil or colored crayon. Weigh box. Fill box with water even with water line. Weigh box and water. Subtract weight of empty box. Remainder is approximate weight of water displaced. Discrepancy is due to the fact that measurement was taken inside of box and water was displaced by outside of box; also it is difficult to get the water inside the pan exactly even with a line on the outside.
  4. Pour water out of box. Place stones or other articles in box until it sinks. Weigh these stones or other articles and compare with weight of water displaced.
  5. Organize a rule that tells when an object will sink and when it will float.

XII. TREES, BUSHES, VINES
- A. Problems and Experiences
  1. To extend identification of trees, bushes and vines.
  2. To enjoy the beauty of trees against a sunset sky.
- B. Suggested Activities
  1. Note appearance of bushes observed in Autumn.
  2. Pupils report trees that are especially beautiful against Winter sunset colorings.
  3. Make pictures of Winter scenes including trees against a sunset sky.
  4. Find from where dealers in Christmas trees obtain their stocks; note living Christmas trees.
  5. Identify Barberry Hedge or other hedge.
  6. Note appearance of Poison Ivy, Virginia Creeper and other vines as they appear in Winter.
  7. Identify ten trees as they appear in Winter. Look especially for trees among those listed for Grades II-V, Appendix.
  8. Identify the following fruit trees as they appear in Winter dress: Peach, Apple, Cherry, Plum, Pear trees.

XIII. SNAKES
- A. Problems and Experiences
  1. To find how snakes live in Winter time.
  2. To study hibernation of snakes.
- B. Suggested Activities
  1. Find why snakes are rarely seen in the open in the Winter.
  2. Note efforts of snakes in aquarium to hibernate.
  3. List some animals that hibernate in the Winter.
  4. Determine reasons for hibernation.

XIV. PROTECTIVE COLORING
- A. Problems and Experiences
  1. To extend knowledge of protective coloring.
- B. Suggested Activities
  1. Consider protective coloring of the polar bear, lion, chameleon.
  2. Consider advantages of animals with protective colorings in escaping from hunters and other enemies.
  3. List some animals whose colorings differ at different seasons of the year. (Gerald Craig, Tentative Course of Study in Elementary Science. Grades V and VI, p. 80)

XV. MAGNETISM
- A. Problems and Experiences
  1. To find types of materials that a magnet picks up.
  2. To learn the value of the compass.
- B. Suggested Activities
  1. Try picking up with a magnet various articles as nails, needles, tacks, hair, paper, and cloth.
  2. Organize the results of these experiments in terms of material from which articles are made.
  3. Pupils magnetize various articles of iron or steel by rubbing against a magnet.
  4. Examine a compass. Note directions in which hands point.
  5. List uses of the compass.
  6. Each pupil make a compass. Cut old watch spring or similar material into short lengths (about 1½ inches will do). Make dent with hammer and nail as nearly as possible in the center of piece of watch spring. Place needle, head down, in cork. Magnetize bits of watch spring and balance on needle. Clip ends until balance is secured. Find if one hand of compass points in direction of North Star.

XVI. MOON, STARS
- A. Problems and Experiences
  1. To review meaning of planets.
  2. To find why we never see but one side of the moon.
  3. To learn the meaning of first order stars.
  4. To locate Sirius, the Dog Star.
  5. To learn why the moon appears as a crescent and gradually enlarges.
- B. Suggested Activities
  1. Review meaning of planet.
  2. Find Venus if visible in West in evening. Find when Venus is the Morning Star.
  3. Find other planets that are plainly visible.
  4. Illustrate why we never see but one side of the

moon with one pupil passing around another pupil so that he always keeps his face toward the pupil around whom he passes.

5. Secure ball. With colored crayon make one-half of ball red or yellow. Pupil hold ball with dark side toward class. Gradually turn ball toward colored half. The color will appeal as a crescent and gradually enlarge.
6. Find Sirius, the Dog Star. Determine why this star is called a star of the first magnitude.
7. Read or tell myth of Sirius.
8. Find stars in Orion's belt.

XVII. LIGHT AND SOUND

A. Problems and Experiences

1. To determine whether light or sound travels the more rapidly.
2. To find rate at which light and sound travel.
3. To compute time it takes light to travel from moon to earth; from sun to earth.
4. To compute time it takes sound to travel from clouds to earth.

B. Suggested Activities

1. A pupil appointed by the class, walk to a point about two blocks away with a drum and sticks or pan and stick in hand. Stop at a point that is in full view of the remainder of the pupils. At a prearranged signal pupil hit drum or pan forcefully. Pupils note that they see the drum or pan struck before they hear the sound.
2. Find distance light travels in one second. (186,000 miles)
3. Compute how long it takes light to travel from the moon to the earth (approximately 230,000 miles); from the sun to the earth (approximately 95,000,000).
4. Pupils count seconds between flash of lightning and thunder as in Grade I. Estimate distance of clouds from earth. (Sound travels about 1100 feet per second in air or approximately one mile to five seconds.)

XVIII. BUILDING MATERIALS

A. Problems and Experiences

1. To extend knowledge of building materials.

B. Suggested Activities

1. List various materials commonly used in buildings that have been observed.
2. Find how lumber is made. Examine pictures illustrating manufacture of lumber.
3. Find how brick is made. If brick is manufactured in the neighborhood visit plant and observe processes.
4. Find how stone for buolding purposes is obtained. Observe stone being dug out of quarry if there is one in neighborhood that may be safely visited. Otherwise, examine pictures of this process.
5. Find how other building materials listed, if any, are obtained.

Helps For The Teacher In Evaluating Progress

1. Was the experiment with the apple worm a success?
2. Determine the pupils in the class that are most likely to become permanently interested in scientific problems. Do they feel that you sympathize with these interests?
3. Are you making a point of stimulating and directing scientific interests in individual cases?
4. List names of house and greenhouse flowers covering all such flowers that pupils in the class can identify. Direct each pupil to choose six of these flowers and make picture of flower following name.
5. Do pupils appreciate the value of the gasoline engine?
6. How many pupils made a workable compass?
7. Test pupils on their knowledge of the reasons for the phases of the moon.
8. Organize a true-false test covering the facts that you feel should be mastered in addition to the material covered in the fact tests that have been suggested.

SPRING AND SUMMER

I. FLOWERS, VEGETABLES, HOME AND SCHOOL GARDENS

A. Problems and Experiences

1. To extend knowledge of flowers.
2. To learn the value of a vegetable garden.
3. To learn essential factors in carrying on such a garden successfully.
4. To learn how to grow vegetables for early use.
5. To learn how to have a successful garden.

B. Suggested Activities

1. Identify fourteen garden flowers in Spring and Summer. Look especially for flowers among those listed for Spring and Summer, Grades I-V, Appendix.
2. Where home and school vegetable gardens can be planted pupils plan for such gardens and carry out plans.
3. Discuss financial value of a vegetable garden; the fun of planting and caring for such a garden.
4. Consult people who are successful gardeners as to their methods.
5. In the late Winter or early Spring each pupil determine vegetables that he wishes to grow for early use.
6. Consult neighbors who use the hot bed and cold frame or visit a greenhouse and obtain advice as to their use.
7. Plant seeds in hot bed or cold frame.
8. Determine why the atmosphere in the hot bed and cold frame is warmer than the air outside.
9. When weather is warm enough transplant vegetables or permit them to remain in original bed until ready for use. (Root plants may not be transplanted successfully.)
10. In late Winter or early Spring choose variety and plant tomato seeds. Before close of school transplant to home and school gardens.
11. In early Spring each pupil make a drawing of his home yard showing position of perennials, biennials, and proposed annuals.
12. Teacher help pupil to choose and locate appropriate additional plants and flowers.
13. Discuss need for healthy and perfect seeds and plants.
14. Pupils obtain slips of perennials from neighbors who are willing to give them away and plant them in their own yards.
15. Class help pupils who plant such slips to determine how to prepare soil, how to plant the slips and how to take care of them; also best fertilizer to use if any is needed.
16. Pupils suggest improvements that may be made

in school yards. Carry these out as far as possible.

17. Pupils who are interested establish rock gardens at their homes.
18. If feasible build rock garden on school grounds or in sandtable or box in classroom. Consult florist and others as to suitable flowers and vines and other materials.
19. Discuss essentials in Spring and Summer care of flowers that have been planted.

II. CAVES

A. Problems and Experiences
   1. To find how caves are formed.
   2. To note location of nearby cave or caves.

B. Suggested Activities
   1. Pupils report caves that they have visited.
   2. Locate nearby cave or caves on map. (State Department of Internal Affairs, Harrisburg, Pennsylvania Caves, Bulletin 3, p. 6)
   3. Read descriptions of these caves in this bulletin.
   4. List principal points that a visitor should note in visiting them.
   5. Learn how caves are formed.
   6. Learn meaning of stalagmites and stalactites.

III. WILD FLOWERS

A. Problems and Experiences
   1. To extend knowledge of wild flowers.

B. Suggested Activities
   1. Pupils look for a swamp and other areas in which wild shrubs and flowers grow.
   2. Examine pictures of May Apple, Jack-in-the-Pulpit, Mountain Laurel.
   3. Find when and where these flowers are likely to be found.
   4. Identify eight wild flowers in the Spring and Summer. Look especially for flowers among those listed for Grades I-V, Appendix.
   5. Make pictures of four wild flowers that should be protected.
   6. Pupils and parents who would like a wild flower garden obtain seeds or plants of wild flowers from dealers in such seeds and plants.

NOTE: Wild flowers and plants should not be transferred from their native haunts for such a garden. When transferred in this way many species die. In general, such flowers and plants should not be disturbed. Seeds and plants obtained from dealers are much more likely to grow.

IV. INSECT PESTS

A. Problems and Experiences
   1. To continue study of insect pests.

B. Suggested Activities
   1. Review previous work respecting orchard diseases and insect pests.
   2. Find specimens of Apple Maggot Fly. Decide why it is important that the Apple Maggot Fly is destroyed.
   3. Note Coddling Moth in apple trees. (They usually appear about three or four weeks after the blossoming period of the apple. A second generation emerges in the late Summer.)
   4. Each pupil note during the Spring and Summer the best fruit orchards among those that he has opportunity to see.
   5. Find methods used by the owners to keep these orchards in good condition.
   6. Correlate study of Apple Maggot and other orchard diseases and insect pests with Spring Arbor Day. (Pennsylvania Department of Agriculture, General Bul. 477, Oriental Fruit Moth.)

V. SCIENCE IN THE HOME

A. Problems and Experiences
   1. To determine why people use refrigerators.
   2. To organize some rules for their use.

B. Suggested Activities
   1. Place portion of cooked fruit in warm room until it ferments. Place same amount and kind of fruit for same length of time in cold refrigerator.
   2. Determine advantage. Compare results.
   3. Pupils find with thermometer coolest part of refrigerators in their homes.
   4. Apply this information to the placing of food in these refrigerators.
   5. List various types of refrigerators used in homes, as ice, electric, gas.
   6. Prove through the following experiment whether it is advisable to follow the suggestion made by many people that the ice in the refrigerator should be wrapped in heavy paper or cloth, such as a rug or piece of carpet, because it will thus last longer: Make a note of temperature at several points in refrigerator while ice is unwrapped. Wrap ice and note temperature at same points in refrigerator.
   7. Organize a recommendation as to the advisability of wrapping ice.
   8. Determine best place in refrigerator for articles that need to be kept especially cool.

VI. SANITATION

A. Problems and Experiences
   1. To determine need for safe disposal of waste.
   2. To learn some of the characteristics of good plumbing.

B. Suggested Activities
   1. Consider method for taking care of waste material in community.
   2. Discuss meaning of sewer system; cesspools, and other means for taking care of waste material where a community sewer system is not in operation; dangers of accumulated waste in homes and communities.
   3. Consult plumbers as to ways in which sewer gasses are kept from entering homes through plumbing; as to general characteristics of good plumbing.

VII. TREES

A. Problems and Experiences
   1. To extend knowledge of trees and bushes.

B. Suggested Activities
1. Note results of apple seeds planted in Autumn. Pupils care for young trees during Summer.
2. List some common medicinal and food products obtained from trees.
3. Identify ten trees in Spring and Summer dress. Look particularly for trees among those listed for Grades II-V, Appendix.
4. Identify five fruit trees as they appear in the Spring and Summer. Look especially for Peach, Apple, Cherry, Plum, Pear trees.
5. Note changes in Barberry Hedge with coming of Spring and Summer.
6. Class determine someone that it especially wishes to honor. Plant a tree and name it for this person.
7. Correlate unit with Spring Arbor Day.

VIII. GEOLOGICAL NATURE STUDY

A. Problems and Experiences
1. To determine whether nearby streams are filling up, or widening or deepening their beds.
2. To extend identification of stones.

B. Suggested Activities
1. Review effect of rain upon soil.
2. Make school journeys to nearby streams and note whether banks and bottom of stream are being worn away or are being built up from sediment carried into stream.
3. Determine differences likely to result in the case of the swiftly flowing stream and the sluggish stream.
4. Make school journey to nearby rock formation, if there is such. Note stones of same material as rock.
5. Teacher exhibit pieces of two or three common rocks in neighborhood. Label each one. Pupils note stones in their collection that are evidently pieces of same type of rocks.
6. Each pupil try to add at least one stone to his collection. Try to find name of this stone.

IX. TRANSPORTATION

A. Problems and Experiences
1. To determine some methods through which transportation may be made safe.

B. Suggested Activities
1. Discuss need for frequent inspection of automobiles.
2. Organize main points in safe driving.
3. Secure some person who is well informed on the subject to explain means taken by railroads to make travel safe; by aircraft companies to make air travel safe.
4. Give principal uses of the following in making transportation safe: speedometer and emergency brake in automobile; the block system; the airbrake; throttle; parachute; air chambers in boats; life preservers.

Desirable: Films, Pageant of the Iron Horse, Baltimore and Ohio Railroad, Baltimore, Maryland. Free.

X. FISH

A. Problems and Experiences
1. To extend knowledge of parental care among fish.

B. Suggested Activities
1. Discuss parental care among fish. (State Board of Fish Commissioners, Bul. 4, A Treatise on the Fish of Pennsylvania, beginning p. 17)
2. Review parental care among Bullheads. (See Grade III)
3. Make picture illustrating parental care among Bullheads.
4. Find some interesting facts about the Stickleback as a father. (Comstock, Handbook of Nature Study, page 168, Comstock Publishing Company, Ithaca, N. Y.)
5. If Stickleback can be obtained in community place some such fish in an aquarium and observe activities.

XI. INSECTS AND ARACHNIDS

A. Problems and Experiences
1. To study the life history of the Isabella Tiger Moth.
2. To extend knowledge of spiders.
3. To observe the activities of the ant.
4. To consider the life history of the bee.
5. To consider means for the control of the Japanese Beetle.

B. Suggested Activities
1. Observe the foods of the Crab Spider and the Jumping Spider.
2. Note changes in Wooly Bears. Find principal points in life history of the Isabella Tiger Moth.
3. Learn main points in the life history of the bee.
4. Find how bees take care of their eggs and larvae.
5. Find what is meant by a pedigreed queen bee; what qualities it is important that a queen bee give the bees that hatch from her eggs (good health, high production of honey).
6. Find reasons for requiring queen bee establishments to be licensed.
7. Discuss the dangers of insectides to the bee if placed on plants that the bee visits.
8. Review material on the potato beetle in Grade IV.
9. Study life history of the Japanese Beetle.
10. List some plants attacked by the Japanese Beetle.
11. Organize principal methods used in the attempt to exterminate the Japanese Beetle and prevent its spread.
12. If there is an infestation of Japanese Beetles in neighborhood interview people whose crops the beetle has attacked as to methods which they are using to check the spread of this pest.
13. Organize means through which class may help control the spread of the Japanese Beetle.
14. Pupils answer this question: Why is the Japanese Beetle so destructive in the United States while in Japan it does little harm?

15. Define the term "parasite" as used in relation to insects.
16. What has the government done to find and import into United States parasites that destroy the Japanese Beetle?
17. Class prepare a booklet on the Japanese Beetle; its life history, plants attacked, and means for its extermination and control. Illustrate with drawings.
18. Make a laboratory study of the ant:

A large oblong baking pan may be used as the foundation. In this place a piece of board an inch or more thick with dimensions two or three inches less than that of the pan. Obtain two panes of window glass at least three or four inches shorter than the board. Break off corner of upper glass. Obtain ants, eggs, and larvae with some earth from a convenient ant nest. Place earth between two panes of glass. Place ants with eggs and larvae on portion of board extending beyond window glass. Within a short time the ants will carry the eggs and larvae to the earth between the panes of glass and will establish a nest there. If only enough earth is placed between the glasses so that passage ways are just the height of the ant, activities in the nest can be observed easily. A piece of board or heavy cardboard should be placed over the nest when it is not being observed as the ants naturally live in darkness. Occasionally a small quantity of water should be squeezed from a sponge or rag at the broken corner of the glass so as to provide some moisture. Pour one-half inch or more of water in baking pan depending upon thickness of board holding the nest. This will keep the ants from escaping. Food that ants like should be placed on the extension of the board. Uneaten food should be removed every day. Learn principal points in the life history of the ant. Make drawing of the underground home of the ant.

Desirable: Motion picture, Bees, How They Live and Work. United States Department of Agriculture, Washington, D. C. (free); Motion Pictures: Ants. Pathe Company, New York City.

XII. Grasses

A. Problems and Experiences

1. To learn how grasses reproduce themselves.
2. To find names of some grasses used for meadows in community or nearby that grow unusually well.
3. To find names of some grasses used in unusually good lawns in the community.

B. Suggested Activities

1. In early Spring dig up a piece of sod. Note how this sod is prepared to send up grass shoots.
2. Note that grasses of some kind grow everywhere except in sand and in regions perpetually covered by ice and snow.
3. Note best looking lawns in the community. Find names of grasses in these lawns and methods followed to keep them in good condition.
4. Note best looking meadows in neighborhood. Find kinds of seed used, methods of plowing and other factors that the owner thinks have been important in securing superior results.
5. Get seeds of at least four types of grasses commonly used for meadows or lawns in neighborhood. Plant each variety in a pot in early Winter. Label each pot. Place in sunny location. Water. Keep record sheet for each pot giving date of sowing, date when seeds sprouted and other important points. Try to bring plants to full maturity so that flowering parts and seeds may be observed and studied before the close of school.
6. List some enemies of good lawns.
7. Consider how these may be controlled or removed.

XIII. Birds

A. Problems and Experiences

1. To extend knowledge of birds.
2. To extend knowledge of foods eaten by birds.

B. Suggested Activities

1. Note birds identified in Autumn that nest in community.
2. Observe at least four birds that come to neighborhood for Spring and Summer only. Where do these birds spend the Winter. Note type of nests built by these birds.
3. Try particularly to find birds included in the bird list for Grades I-V, Appendix.
4. Correlate unit with a Bird Day Program.

Helps For The Teacher In Evaluating Progress

1. Did the Wooly Bear Caterpillar pass through the pupae stage and the moth emerge? If this was not a successful project try to determine reasons for the failure.

2. Have the apple seeds planted in the Autumn sprouted? Have steps been taken to protect the young trees?

3. Place pictures of wild flowers covering those that pupils have learned to identify on blackboard tray and write a number above each one, or arrange in some other way. Cover names of flowers if these appear on pictures. Pupils write number on piece of paper with name of flower following.

4. Carry out same type of test for trees and birds.

5. Have you any reason for believing that the experiment with refrigerators has given the pupils a scientific attitude toward the use of the refrigrator?

6. Are the pupils in the class anxious to help in controlling the Japanese Beetle?

7. Organize tests of various types covering twenty points in the years work exclusive of identification of flowers, trees, and birds.

8. Test yourself on the following points?

Have the pupils in the class grown during the year in their desire to find out things through observation; in appreciation of the beautiful in nature; in courteous conduct toward the teacher and one another? Has the form and content of their questions improved?

References

Comstock, Anna, Handbook of Nature Study
Craig, Gerald, Textative Course of Study in Elementary Science for Grades III and IV; also for Grades V and VI
Craig & Condry, Pathways in Science, Book V, Learning About Our World
Downing, E. R., Our Living World
Downing, E. R., Our Physical World
DuPuy, William Atherton, Our Insect Friends and Foes
DuPuy, William Atherton, Our Animal Friends and Foes
DuPuy, William Atherton, Our Bird Friends and Foes

DuPuy, William Atherton, Our Plant Friends and Foes
Fox, Florence C., How the World Rides
Gehrs, John, Nature Study, Book II
Green, George, A Survey of Nature
Gress, Ernest, Common Wild Flowers of Pennsylvania
Illick, Joseph, Common Trees of Pennnsylvania
Matheny, W. A., Seed Dispersal
Medsger, Oliver, Nature Rambles—Spring
National Geographic Society, Washington, D. C., Colored Pictures of Animals, Flowers, Fish
Pennsylvania State College, Division of Agriculture Extension, Circular 122, April 1929, Vegetable Garden Insects; Bul. 277, Emergence Cages and Bait Pails for Timing Coddling Moth Sprays; Extension Circular 109, March 1927, Training the Young Apple Tree
Perry Picture Company, Malden, Mass., Pictures of Birds
Persing & Thiele, Elementary Science By Grades, Book V
Shoffner, Charles, The Bird Book
State Board of Fish Commissioners, Bul. 1, Fish Ponds for the Land Owners, Bul. 2, Selective Breeding of the Yellow Perch, Bul. 4, A Treatise on the Fish of Pennsylvania
State Board of Game Commissioners, Bul. 9, A Year's Program for Bird Protection in Pennsylvania
  Bul. 10, Game Administration in Pennsylvania
  Bul. 11, More Food for Upland Game
  Bul. 12, The Pennsylvania Deer Problem
  Bul. 14, Pennsylvania's State Game Refuges and Public Hunting Grounds
  Bul. 15, An Introduction to the Mammals of Pennsylvania
State Department of Agriculture
  Bul. 473, The Japanese Beetle in Pennsylvania
  Bul. 480, Scale Insects Injurious in Pennsylvania
  Bul. 477, The Oriental Fruit Moth
  Bul. 439, Peach Yellows and Little Peach
  Bul. 508, Preservation of Wild Flowers
  Bul. 489, Mexican Bean Beetle in Pennsylvania
  Bul. 448, Pennsylania Weeds, Their Control and Eradication
  Bul. 481, The Hessian Fly in Pennsylvania
State Department of Forests and Waters
  The Common Trees and Shrubs of Pennsylvania
  Bul. 31, In Penn's Woods
  Bul. 37, The State Forests of Pennsylvania
  Circular 28, Plant Forest Trees on Idle Acres
  Circular 29, Forest Tree Planting Recommendations
  Circular 31, Forest Trees to Plant
  Circular 34, Camp Sites in Pennsylvania
State Department of Internal Affairs, Bul. G-3, Pennsylvania Caves
Sutton, George, Birds of Pennsylvania
Ullrich, F. T., Our Farm World
U. S. Department of Agriculture, Farmers Bul. 1371, Diseases and Insects of Garden Vegetables
The World Almanac

GRADE SIX

AUTUMN

I. FLOWERS; HOME AND SCHOOL HOUSE PLANTS AND GARDENS

- A. Problems and Experiences
  - 1. To extend identification of flowers.
  - 2. To organize an exhibit of flower portraits.
  - 3. To extend home and school flower gardens.
  - 4. To improve and extend house plants in the school and home.
- B. Suggested Activities
  - 1. Review work on flowers in previous grades.
  - 2. Master identification of fourteen garden flowers. Look especially for flowers among those listed for Autumn for Grades I-V, Appendix.
  - 3. Examine pictures of flowers.
  - 4. Make flower portraits: Each pupil secure a pasteboard or wooden box of size required for his flower portrait. Line inside of box with cloth or paper of color desired. Place picture frame on front of box. Frames used may be made by pupils of wood or cardboard painted in color desired; or unused frames may be secured from homes. Arrange boxes on table or shelf. Each pupil place in his box a bouquet of flowers in a vase or glass. Invite guests to see these flower portraits. If pupils desire, judges may be appointed to determine the best portraits in classes previously determined, as the three most beautiful portraits; the three most beautiful portraits in yellow effects, blue effects, or other color effects.
  - 5. Learn to identify at least four wild flowers that bloom in the Autumn. Look especially for wild flowers among those listed for Grades II-V, Appendix.
  - 6. Each pupil plan for extensions in home flower gardens and house plants. Class plan for extensions in school flower garden if such a garden can be successfully carried on; in plants for classroom if they can be kept from freezing during the Winter.
  - 7. Committees appointed by class consult proprietor of greenhouse and people who are successful in raising house plants as to methods for planting and caring for list of house plants, that pupils wish to raise in their homes and classroom.
  - 8. Each pupil carry out plans that he has made, for house plants and home gardens.
  - 9. Class and teacher install plants in classroom if it has been decided to attempt to have such plants.

II. TREES

- A. Problems and Experiences
  - 1. To extend identification of trees.
  - 2. To note growth of apple seeds planted previous Autumn.
  - 3. To learn the functions of each part of a tree.
- B. Suggested Activities
  - 1. Pupils note what has happened to apple seeds planted previous Autumn. If results are not satisfactory, determine probable reasons. Protect and care for young trees that have grown from these seeds.
  - 2. Master identification of ten trees other than fruit trees as they appear in Autumn dress. Look especially for trees among those listed for Grades II-V, Appendix.
  - 3. Identify five fruit trees as they appear in Autumn. Look especially for Peach, Apple, Cherry, Plum and Pear Trees.
  - 4. Arrange during the year an exhibit for ten trees found in community as follows: Picture or drawing of tree in Winter and Summer; pressed leaves; nut or seed.
  - 5. List different parts of a tree. Determine the function of each part. (Illick, Common Trees of Pennsylvania, page 7) (Edgerton, D. Priscilla, The Forest, p. 5, U. S. Department of Agriculture).
  - 6. Correlate unit with Autumn Arbor Day.

III. INSECTS

- A. Problems and Experiences
  - 1. To help to destroy the Tussock Moth.
- B. Suggested Activities
  - 1. Note effect upon trees of the Tussock Moth.
  - 2. Locate trees containing nests of Tussock Moth eggs.
  - 3. Pupils ask parents and other adults to help destroy these nests. (Included, among other sources, in Elementary Science by Grades, Ch. VI, Persing and Hollinger, D. Appleton, New York).
  - 4. Continue destruction of these nests during Winter and Spring.
  - 5. Taking 400 eggs as an estimate for each nest, pupils estimate total number of eggs destroyed at the close of the Autumn season; at close of Winter; at close of Spring; total for year.

IV. BIRDS AND ANIMALS

- A. Problems and Experiences
  - 1. To extend identification of birds.
  - 2. To note protective coloring among birds.
  - 3. To determine value of bird refuges.
  - 4. To determine need for protection of game birds.
  - 5. To consider dangers of excessive numbers of game animals.
- B. Suggested Activities
  - 1. Make a chart listing at least ten species of birds exclusive of game birds found in Pennsylvania with the following information respecting each one: Description (picture may

be drawn or outstanding marks may be listed); foods; helpful or harmful to man; season or seasons found in state.

2. Give reasons for the establishment of bird refuges. (State Board of Game Commissioners, Bul. 9, A Year's Program for Bird Protection in Pennsylvania, p. 29).
3. List a minimum of two famous bird refuges in the United States. (World Almanac, 1930, World and Telegram, New York City, lists national bird refuges in the United States)
4. Examine pictures illustrating bird refuges.
5. Discuss the Bok bird refuge in Florida.
6. Pupils choose spots in their yards that birds like; provide with water and food if needed; permit nothing to disturb birds who may rest there.
7. Visit a bird refuge if there is one nearby.
8. Pupils review materials respecting game birds and animals in Grade V.
9. Class make booklet of drawings or pictures of game birds that are permanent residents in Pennsylvania.
10. Identify three game birds that are permanent in Pennsylvania. Look especially for the Bob White (Quail, Partridge), Ring-Necked Pheasant, Ruffed Grouse.
11. Pupils discuss game birds that are migrants as Ducks, Geese and Brant, Woodcock. (The Woodcock occurs in Pennsylvania chiefly as a migrant although breeding birds are frequently found in the lowlands along our streams).
12. Discuss reasons for limiting seasons when game birds may be hunted.
13. Determine to what extent birds studied have protective colorings.
14. Pupils discuss methods through which food may be provided for game birds and animals when natural foods are scarce. (State Board of Game Commissioners, Bulletin 11, More Food for Upland Game)
15. Determine why the bear is ravenously hungry in the early Spring.
16. Discuss reasons for confining the hunting of elk in Pennsylvania to male animals with four or more points to the antler; why it is considered unwise to further stock these animals. (State Board of Game Commissioners, Bulletin 10, Game Administration in Pennsylvania, pp. 12, 13)
17. Find meaning of "forest weeds"; determine their value in the feeding of game birds and animals. (State Board of Game Commissioners, Bulletin 11, More Food for Upland Game, p. 27)
18. Discuss disadvantages of excessive number of wild deer.
19. Discuss reasons why no one should hunt for more game than he will use as food.
20. Consider how unnecessary suffering to game birds and animals may be avoided in hunting them.

V. INSECT PESTS

A. Problems and Experiences

1. To find how to prevent the spread of the European corn borer.

B. Suggested Activities

1. If the corn borer is found in the community examine infested stalks.
2. If neighborhood is not infested with corn borer find nearest points of infestation.
3. Discuss means through which infestation may be prevented and controlled.
4. Discuss following problem: A farmer with stock to feed plants corn for feeding purposes. The crop is attacked by the European corn borer and his harvest is but one-half of what it should be. How does this affect his profit on his farm?
5. Teacher and pupils working together write an article on national damage by the European corn borer and how to prevent its spread. Send to the local press.

VI. TREE DISEASES

A. Problems and Experiences

1. To learn how to prevent and control the White Pine blister rust.
2. To note results of the Chestnut blight.

B. Suggested Activities

1. Note White Pine trees that are infected with blister rust, if there are any such in neighborhood.
2. Individuals in class look for White Pine Blister rust when riding outside of community and in visits to forests and other places where White Pine may be found.
3. Make picture of White Pine tree affected with blister rust.
4. Organize method for preventing the spread of White Pine blister rust.
5. Find in community plants that act as hosts to the White Pine blister rust, if this disease is found in neighborhood.
6. Decide what would happen to the White Pine blister rust if all of its host plants were destroyed.
7. If there are White Pine trees in the community, class request people that they know with ribes on their land to remove them.
8. Determine why the Chestnut tree has almost disappeared from the Eastern part of Pennsylvania. (Chestnut blight, also called the Chestnut canker, the Chestnut bark disease, Endothia Canker)
9. If there are Chestnut trees in the community that are suffering from Chestnut blight note symptons of this disease.
10. Find from where the Chestnut blight came into the United States. (Probably imported from China where it does little harm. The Chestnut tree in the United States contracts this disease more readily and has less resistance than the Chinese Chestnut)
11. Correlate unit with Autumn Arbor Day.

VII. SNAKES

A. Problems and Experiences

1. To learn to identify venomous snakes in neighborhood if there are any such.

B. Suggested Activities

1. Pupils learn to identify venomous snakes in the community, if there are any such. (Pictures and descriptions may be used. If there is a museum nearby perhaps these snakes may be observed there)
2. Discuss precautions that should be taken to prevent venomous snake bites.
3. Committee appointed for purpose inquire of doctor best thing to do in case of bite by a venomous snake.
4. Report suggestions given to class.

VIII. AUTUMN

A. Problems and Experiences

1. To enjoy especially beautiful gardens or other spots typical of the Autumn season.

B. Suggested Activities

1. Discuss especially beautiful Autumn spots and scenes.
2. Note the beauty of Autumn swamps.
3. Visit some of these spots and scenes.
4. Pupils collect poems descriptive of Autumn beauties.
5. Individual pupils write Autumn poems or class and teacher working together write a composite Autumn poem.

IX. ELECTRICITY

A. Problems and Experiences

1. To generate electricity.
2. To find principal uses of electricity.
3. To determine why electric wires are insulated.
4. To find why fuses are used.

B. Suggested Activities

1. Pull very dry paper between arm and body until it crackles. Place hair or small piece of thread nearby. Note what happens.
2. Pupils tell stories of crackling of hair and other stories denoting the presence of electricity.
3. List some of the most important uses of electricity.
4. Discuss meaning of insulation of electric wires.
5. Discuss danger of non-insulation of electric wires.
6. Make trip to electric light or other electric plant if conveniently located.
7. Discuss dangers of flying a kite with a wire string.
8. Examine electric cords in homes to find if insulation is imperfect.
9. Explain use of the fuse in lighting by electricity; what is meant by the term "blow a fuse."
10. A woman who was ironing with an electric iron set the iron down on a nearby stove. There was a flash and following this no lights could be obtained in the house. Determine the reasons for this.

X. COMMUNICATION

A. Problems and Experiences

1. To learn most important methods of communication.

B. Suggested Activities

1. Discuss methods of communication as conversation, the written or printed word, the telephone, the telegraph, the radio.
2. Examine pictures of ancient writing. Compare with present script.
3. Find the name of the inventor of printing; of the telephone, telegraph, radio.
4. Pupils report distant points from which they have received letters; telephone messages, telegraph messages; from which they have heard messages over the radio.
5. Discuss advantages of present methods for communication over those of a hundred years ago.

XI. FIRE

A. Problems and Experiences

1. To learn how to secure a successful fire in the open.

B. Suggested Activities

1. Review material respecting fire in Grades IV-V.
2. Consider need for knowing purposes for which fire is intended, as for cooking; for lighting.
3. Consider preparation of fire for each purpose.

NOTE: Sources for securing information respecting this topic include Scouting for Girls, Official Handbook of the Girl Scouts, the Girl Scouts, Inc., 189 Lexington Avenue, New York City; Ernest Thompson Seton, The Book of Woodcraft, Doubleday, Doran and Company, Garden City, New York.

XII. TRANSPORTATION

A. Problems and Experiences

1. To determine why the dirigible and the airplane stay in the air; why they have great value as a means of transportation.

B. Suggested Activities

1. Discuss following points: Is gas in dirigible heavier or lighter than air? What is the use of the engine in a dirigible?
2. Determine why a stone or other heavier-than-air object will travel in the air some distance if thrown into the air with force.
3. Apply this principle to the airplane.
4. Answer these questions:
   Why does the airplane fall to the ground when the engine stops running?
   Why is it important that the airplane be as light as it can be made with safety?
   Why may the dirigible continue in the air when its engine stops if conditions are favorable; what dangers arise if the engine stops working?
5. Discuss relationship of the development of the airplane and dirigible to a larger acquaintance with people in other parts of the world.

Desirable: Film: Transportation. Commercial Museum, Philadelphia. Free.

XIII. Good Roads

A. Problems and Experiences

1. To determine the characteristics of a good road.

B. Suggested Activities

1. Pupils note new hard-surfaced highways over which they pass when riding in an automobile. Report such pieces of road to class.
2. If there is a new hard-surface highway in the neighborhood measure width of this highway and width of shoulder.
3. Determine why it is advisable to have a wide shoulder.
4. Determine why new roads are built thicker at the edges than in the center.
5. Correlate above with safety education.
6. Pupils note composition of improved highways over which they ride. (State Department of Highways defines improved highways as highways "which are dustless and have a hard riding surface fit for travel in all kinds of weather. Such a definition includes bituminous concrete, bituminous macadam, brick and sheet asphalt and the cement concrete highways, but earth, shale, gravel, stone roads are classed as unimproved")
7. Find how the macadam road got its name.

Desirable: Safety film, Keystone Automobile Club, Philadelphia, Pennsylvania. Free.

XIV. Air

A. Problems and Experiences

1. To learn meaning of the term vacuum.

B. Suggested Activities

1. Obtain a tin can with a cover that presses into the top of the can. Cans of this type are often used as containers for paint and molasses. Barely cover the bottom of can with water and set over stove or other source for heat. Lay cover on lightly but do not press down.
2. When the steam from the water fills the can remove from stove and tightly press down cover. The steam has driven out most of the air and as the can cools this steam will condense and become water again and the can will contain little or no air. The pressure of the air on the outside will crumple the can. (Downing, Our Physical World, Longmans, Green and Company, p. 111)
3. Boil a small quantity of water as above. Press down cover while steam is flowing freely. Place a little flour, cornstarch or similar material in a spoon and hold close to cover while it is being removed. Why is the flour or other material drawn into the can? Why must the vessel chosen for this experiment be a strong one.
4. Find reasons for thunder.
5. Explain principle of suction pump used to clean out stopped up drain pipes.
6. Define the term vacuum.

XV. Barometer

A. Problems and Experiences

1. To learn how air pressure is measured.

B. Suggested Activities

1. Examine barometer and determine principle upon which it works.
2. Compare type of measurement made with barometer with type of measurement made with thermometer.
3. On blackboard or cardboard organize a weather chart as follows: First column, date and hour of report; second column, reading of barometer; third column reading of thermometer; fourth column, weather (cold, warm, clear, cloudy, rainy, windy or other descriptive terms).
4. Carry on this weather chart for a month or more.
5. Note relation between barometer and various types of weather.
6. Discuss the following questions: Suppose it is very warm in one area and considerably cooler in an area two hundred miles south of the first area, toward which direction is the wind likely to blow?
7. Discuss tornadoes and hurricanes in terms of the above.

Helps For The Teacher In Evaluating Progress

1. Are any pupils planning to visit some of the beautiful spots or natural objects reported by pupils who had seen them during the Summer?
2. Is the ability of the pupils in the class to identify flowers, trees, and birds a satisfactory one?
3. Were enough Tussock Moth egg nests destroyed to appreciably lower the damage to trees caused by the larvae of this moth?
4. Has the work of the class as it related to the White Pine blister rust been of a practical character?
5. Do the pupils in the class sense the changes in communication and transportation that have taken place within the last century?
6. Were the experiments with air successful?
7. Did the pupils find a relationship between the barometer and the weather?
8. Organize tests covering facts that you think pupils should know as a result of the Autumn study of science.

WINTER

I. Light

A. Problems and Experiences

1. To prove that light travels in a straight line.

B. Suggested Activities

1. Review work in Grade V respecting light.
2. Note the straight lines in a ray or beam of sunlight.
3. Note the straight lines going out in all directions from an electric street light or other light when it is raining or snowing. (The beams of light illuminate the rain drops or snow flakes and they are thus visible).
4. Pupils try the following experiment:

Cut out one end of a pasteboard box such as a shoe box. Paste tightly over this end a piece of white tissue paper or tracing paper or tracing cloth. In the center of the other end bore a tiny hole like a pin hole. Set the box on the sill of an open window, pin hole toward the light. Throw a dark cloth over the head and the end of the box covered with tracing paper so that no light can get to eyes except that which comes through the pin hole. On the tracing paper an inverted image of the landscape will be seen.

Answer these questions: Why is the image of the landscape inverted? (Imagine a string attached to the top of the highest point in the landscape, pulled through the pinhole and continued until it touches the back of the box; imagine a string attached to the lowest part of the landscape and continued in the same way. This principle applies to the whole of the landscape.) Why do we see the inverted image on the back of the box and see the landscape in proper position if we look directly at it? (The light rays enter the eye as they enter the pin hole in the box. Within the eye, however, there is provision through which the inverted image is corrected.)

II. Farm Animals and Poultry

A. Problems and Experiences

1. To find how the State helps to keep farm animals healthy; why the State requires tuberculous cattle to be killed.
2. To find how the State helps to keep poultry healthy.

B. Suggested Activities

1. Discuss illnesses of which pupils know that may be caused by eating unhealthful food.
2. Discuss these questions: Why is it dangerous to drink milk from a cow that has tuberculosis? Why does the State through the Bureau of Animal Industry inspect cattle and cause tuberculous animals to be killed? How are hog cholera losses reduced? What does the Bureau of Animal Industry do to control diseases among poultry?

III. Scientific Helps in the Home and School

A. Problems and Experiences

1. To learn the principles of the electric toaster, waffle iron, and flatiron.
2. To determine how science helps us to learn easily and correctly.

B. Suggested Activities

1. Review previous materials on science in the home.
2. Discuss advantage of electric toaster, waffle iron, and flatiron.
3. Explain why the electric toaster, waffle iron, and flatiron generate heat.
4. If there is no electricity in neighborhood, examine pictures of these home helps.
5. List scientific helps used by the class such as maps, globes, books, phonograph.
6. Answer this question: Why are maps, globes and books included in a list of scientific classroom helps.
7. List scientific helps not available to the class that the class would like to have (This topic should be worked out with the scientific helps that the school possesses as a center).

IV. Sun, Moon and Stars

A. Problems and Experiences

1. To find why it is so cold at the Poles.
2. To learn how Peary and Byrd reached the Poles.
3. To find reasons for eclipses of the moon and sun.

B. Suggested Activities

1. Answer the following:
   a. When Peary discovered the North Pole in what part of the sky did he see the North Star.
   b. Why are the two stars in the front of the bowl of the Big Dipper sometimes called the pointers.
2. With light and globe show why it is so cold at the North Pole and at the South Pole; why the Sun when seen appears far from the Zenith.
3. Tell how Peary reached the North Pole; how Byrd reached the South Pole.
4. Cut out a disk to represent the sun. Show with shadows of two balls, one representing the earth and one representing the moon, reasons for an eclipse of the sun and for an eclipse of the moon.

V. Heredity

A. Problems and Experiences

1. To apply the principle of heredity to human beings.

B. Suggested Activities

1. Review points respecting heredity in previous grades.
2. Determine some reasons why people are proud of heathly ancestors; of well behaved ancestors.
3. Consider whether or not people desire to bequeath good health to their children; how parents may be most certain to do this; at what age people should begin to build up good health and good morals to bequeath to their children.

VI. The Making of Books, Magazines, and Newspapers

A. Problems and Experiences

1. To find principal developments in history of printing.

B. Suggested Activities

1. Find how books were made before the invention of printing. Discuss beauty of some of these books both as to lettering and illustrations.
2. Examine pictures of pages from these books. Try to see any such books in neighborhood.
3. Discuss reasons why books made in this way would be expensive.
4. Discuss present-day methods for making pictures for books, magazines, and newspapers.
5. Make trip to publishing plant if one is conveniently near.
6. Find meaning of linotype.
7. Organize main points in the printing of a book or newspaper.
8. Give main points in the life of Johannes Guttenberg, the inventor of printing.

Desirable: Films: The Making of a Book, J. C. Winston Company, Philadelphia, Pennsylvania;

Making a Newspaper, Roland Rogers Company, 74 Sherman Street, Long Island City, New York. Free.

VII. CAVES

A. Problems and Experiences

1. To consider especially famous caves in other states and other countries.

B. Suggested Activities

1. Pupils discuss caves in Pennsylvania that they have visited; caves that they have visited in other states and countries.
2. Discuss Mammoth Cave, Luray Caverns, Carlsbad Cavern.
3. Examine pictures of famous caves in the United States and in other parts of the world.
4. Organize a travel route for the purpose of visiting ten of the most famous caves in the world.

Desirable: Stereographs or lantern slides. See Catalog No. 26, Keystone View Company, Meadville, Pennsylvania.

VIII. PREHISTORIC ANIMALS

A. Problems and Experiences

1. To become acquainted with some prehistoric animals.

B. Suggested Activities

1. Examine pictures of prehistoric animals.
2. Note the resemblance between the mastodon and mammoth and the elephant.
3. Compare the size of these animals with that of the present day elephant.
4. Find whether or not the mammoth and mastodon lived in Pennsylvania; in the United States.
5. Discuss how we know that these animals and others now extinct once lived upon the earth and where they lived.
6. Examine pictures of the Saber Toothed Tiger (Dinictis).
7. Discuss possible reasons why this animal has become wholly extinct.
8. List nearest museums in which remains of prehistoric animals may be seen.

IX. SCIENCE IN THE HOME

A. Problems and Experiences

1. To find how the vacuum cleaner helps in housekeeping.
2. To find how it works.

B. Suggested Activities

1. Find fan in vacuum cleaner which creates a vacuum into which the dirt is sucked. Compare with experiment in Autumn.
2. Discuss the use of the vacuum cleaner in relation to saving in time and effort.

X. LEISURE-TIME SCIENCE

A. Problems and Experiences

1. To learn some ways in which science contributes to leisure-time interests and pursuits.

B. Suggested Activities

1. Pupils list some ways in which science contributes to leisure-time interests and pursuits, as the use of musical instruments, the radio, the moving picture.
2. Pupils in class who have had opportunity to see moving pictures made or run report experiences to class.
3. Pupils with radios in their homes report interesting musical programs and talks that they have heard recently.
4. Pupils report interesting moving pictures that they have seen.
5. Pupils report whether or not any radio talks that they have heard have dealt with subjects that they have studied in science. If such talks are not given class write letters to several radio stations urging that provision for this kind of material be made.
6. Discuss a good use of leisure time for the pupil who wishes to be a scientist.
7. Organize a Science Fad Exhibit for the display of scientific projects carried on by pupils in their leisure time.

XI. PLANTS AND FLOWERS

A. Problems and Experiences

1. To extend identification of house and greenhouse plants and flowers.
2. To learn how to raise greenhouse plants in the homes.

B. Suggested Activities

1. Master identification of eight house or greenhouse plants or flowers. Look especially for plants or flowers among those listed for Winter for Grades I-V, Appendix.
2. Pupils experiment in their homes and in school in the attempt to raise successfully flowers usually produced only in greenhouses as Winter Roses, Easter Lilies. Get advice of successful growers of such plants.
3. Pupils bring successful plants to school or pupils visit homes in which such plants are successfully grown.

XII. BIRDS

A. Problems and Experiences

1. To extend identification of birds that remain in community during the Winter.

B. Suggested Activities

1. Note birds identified in Autumn that remain in community during Winter.
2. Note Winter foods of such birds; where they sleep; how they protect themselves from the cold.
3. Identify three birds that make their home in neighborhood during the Winter only. Find where these birds make their nests.

XIII. INSECT PESTS

A. Problems and Experiences

1. To continue a consideration of the control of the European corn borer.

B. Suggested Activities

1. Decide how a community can prevent the entrance of the corn borer; how it can control

its spread if it has entered the community; whether or not the community is following these precautions.

XIV. Trees, Bushes

A. Problems and Experiences

1. To extend identification of trees and bushes.
2. To continue study of the White Pine blister rust.
3. To find how to determine the age of a tree.
4. To find very old, famous or unique trees in neighborhood, if there are any such.
5. To note such trees in other localities that pupils may visit.

B. Suggested Activities

1. Master identification of ten trees found in community in Winter dress. Look especially for trees among those listed for Grades II-V, Appendix.
2. Identify five fruit trees in Winter dress. Look especially for Apple, Peach, Cherry, Plum and Pear trees.
3. Continue to care for apple trees that have grown from seeds planted in Grade V.
4. Pupils visit a fruit tree nursery, if feasible, and find how the nursery secures young trees to sell.
5. Learn to identify two hedges. Look particularly for Barberry and Privet Hedge.
6. Make picture that includes a hedge.
7. Have people in community removed ribes from their yards that grow in the neighborhood of White Pine trees?
8. If there are White Pine trees in neighborhood, write article for press pointing out the relation between ribes and the White Pine blister rust and urging every one to destroy any ribes that grow on their land.
9. Learn how to find the age of a tree. (Illick, Common Trees of Pennsylvania, page 15.)
10. Find age of trees where stumps are still standing. Estimate number years it took tree to grow to height of stump. Add to number of rings.
11. Find trees, if there are any such, in neighborhood that may have started to grow when William Penn came to the State; when Washington was President of the United States.
12. Examine material in Illick's Common Trees of Pennsylvania, page 19-27. Class visit any trees mentioned that are in neighborhood or nearby. Individual pupils who may visit any others of these trees report experiences to class.

XV. Science on the Farm

A. Problems and Experiences

1. To determine charactertistics of a scientific farm.
2. Compare modern methods of planting, cultivating, and harvesting with methods of pioneer times.
3. To consider the merits of scientific farming.

B. Suggested Activities

1. List the charactertistics of a scientific farmhouse; for example, modern bathroom, running water throughout house, furnace, electricity.
2. Pupils describe farmhouses that they consider especially convenient and suitable, if they know any such.
3. Examine pictures illustrating modern farming.
4. Examine pictures showing methods of farming in ancient times and in backward countries at the present time.
5. Suggest methods through which farms may be electrified.
6. Inquire of a farmer whose farm is electrified how he secures electricity and in what ways he uses it.
7. Discuss what the scientific farmer does to assure good seed; to control insect pests and plant diseases.
8. Determine why it pays to be a scientific farmer.

Desirable: Stereographs showing primitive agriculture, Catalog 28, pp. 9-13, Keystone View Company, Meadville, Pennsylvania. Stereographs showing modern methods of agriculture, Catalog 28, pp. 9-13, Keystone View Company, Meadville, Pennsylvania.

Helps For The Teacher In Evaluating Progress

1. Was the experiment with light beams a success?
2. Do you think the pupils in the class are beginning to think in terms of the responsibility of the individual for bequeathing good health and good morals to his children?
3. Are your pupils interested in pre-historic animals as a result of their study of such animals?
4. Are your pupils able to make the identifications set up? Are they interested in the control of insect pests and plant diseases?
5. Are your pupils finding the work in science so interesting that attention to the work in hand is a natural situation?
6. To what degree are pupils in the class using their leisure time in scientific pursuits?
7. Were you successful in the experiment relating to eclipses of the earth and moon?
8. Organize tests covering points in season's work that you think pupils should know.

SPRING AND SUMMER

I. Seeds

A. Problems and Experiences

1. To find how the State protects planters from inferior seeds.
2. To determine how immunization may be developed in seeds.

B. Suggested Activities

1. Discuss results if the seed used for planting a piece of land with hay seed is made up of one-half hay seed and one-half seeds of weeds.
2. Consider means through which people who use seeds may be protected from inferior seeds. (Pennsylvania Department of Agriculture, Bul. 507, Explanation of Pennsylvania Seed Law; and Report of Seed Analysis; Compilation of laws Relating to Agriculture and the Laws Administered by the Department of Agriculture.)

3. If although applied several times, vaccination for smallpox fails to "work" on an individual what conclusion may we reach. (That at the present time the person vaccinated is immune to smallpox.)
4. What does the physician seek to find out when he gives the Schick test for Diphtheria?
5. If this test, although applied several times, fails to show a reaction what may we conclude with respect to these individuals?
6. Some types of potatoes are not affected by potato wart. How would you describe such potatoes? (Immune from potato wart.)

   How does bean mosaic affect plants? Some beans are immune to bean mosaic. (Diseases and Insects of Garden Vegetables, U. S. Department of Agriculture, Farmers' Bulletin No. 1371.)

   Occasionally a Chestnut tree is not attacked by the Chestnut blight in spite of the fact that all other Chestnut trees in the vicinity are attacked and eventually killed. What is likely to be true of such a tree.
7. Suggest means through which there are possibilities of seeds or plants being developed that are immune to certain diseases.

II. Water

A. Problems and Experiences
1. To determine why a healthful supply of water in the home is important.
2. To determine what constitutes a scientific water supply.

B. Suggested Activities
1. If the community has a common water supply find out where this is located and how safety from disease organisms (germs) is assured.
2. If wells are the usual source of the water supply in the community find out how they are protected from disease organisms (germs).
3. Pupils examine wells at their homes if they have these. Note if the situation of the well is likely to make it safe from possible germs from nearby barns, outhouses, or other sources of disease.
4. Examine the construction of the well: Is the platform constructed so that water cannot flow back into the well? So that rain cannot wash dirt or germs into the well? Is the well deep enough so that water coming in at the bottom is likely to be safe? Are the walls of the well water-tight to a sufficient depth?
5. Discuss advisability of boiling drinking water if there is a possibility of its containing dangerous germs.
6. Consider drinking water supply for the school from sanitary standpoint.
7. Organize a set of requirements for a healthful community water supply; for healthful wells.
8. If there is a central water supply for the community visit the source of this supply if conveniently near.
9. Define a scientific central water supply; a scientific well.

Desirable: Film: Your Glass of Water. Pennsylvania Board of Censors, Harrisburg, Pennsylvania. Free.

III. Fish

A. Problems and Experiences
1. To find what the State does to keep streams stocked with fish.
2. To study some nationally valuable fish.

B. Suggested Activities
1. Find two or three areas if there are any such in neighborhood that are likely to make good fish ponds.
2. Decide minimum size of such a fish pond. (Disappointment usually results from ponds less than an acre in area.)
3. Pupils build a tiny fish pond on a sandtable or out of doors following directions suggested in the bulletin, Fish Ponds for Land Owners, p. 7-8, State Board of Game Commissioners.
4. Visit owners of fish ponds if there are any nearby.
5. Give main points in the life history of the Eel; Shad.
6. Class make an illustrated booklet of the life history of the Salmon including canning in the factory.
7. Find in what part of the country the Cod is found in large numbers.
8. List other nationally valuable fish.
9. Find what the State does to keep the streams stocked with fish.

Desirable: Films: The Yellow Perch, Pennsylvania State Board of Censors, Harrisburg, Pennsylvania. Free. Films: Brook Trout, Pennsylvania Board of Censors, Harrisburg, Pennsylvania. Free.

IV. Soils

A. Problems and Experiences
1. To find type of soil best suited to different kinds of crops grown in neighborhood.

B. Suggested Activities
1. Place in bottles three or four different kinds of soils found in neighborhood.
2. Note condition and types of crops planted on soils of each kind.
3. Try to determine type of soil upon which different kinds of crops seem to grow best.

V. Birds

A. Problems and Experiences
1. To extend identification of birds.
2. To extend study of protective coloring among birds.

B. Suggested Activities
1. Note birds identified in Autumn that nest in community.
2. Determine whether or not these birds have protective colorings.
3. Note whether the colors of the male or the female bird are more generally protective.
4. Decide why protective coloring for the female bird is a special advantage.

5. Observe at least five birds that come to neighborhood for Spring and Summer only. Note particularly birds included in lists for Grades I-VI, Appendix.
6. Each pupil choose a bird for special Summer study.
7. Correlate unit with Bird Day Program.

VI. GARDENS

A. Problems and Experiences

1. To plan flower and vegetable gardens for the home and school.

B. Suggested Activities

1. Pupils report successful home gardens for previous year.
2. Each pupil plan a flower and vegetable garden for his home yard, if this is feasible.
3. Plant garden as planned.
4. Class plan for school gardens if their establishment is feasible. (Summer care is a requisite for a successful school garden)

VII. FLOWERS

A. Problems and Experiences

1. To extend identification of garden flowers and wild flowers.
2. To determine wild flowers that should be protected.
3. To learn principal parts of a flower.

B. Suggested Activities

1. Master identification of fourteen garden flowers. Look especially for flowers among those listed for Spring and Summer, Grades I-V, Appendix.
2. Identify eight wild flowers that bloom in the Spring and Summer. Look particularly for flowers among those listed for Spring and Summer, Grades I-V, Appendix.
3. Pupils check wild flowers that they know on list provided by teachers. (Helpful lists against which to check are found in A Survey of Nature, George R. Green; The Slingerland-Comstock Company, Ithaca, New York; p. 290 ff.)
4. Pupils double check wild flowers that they know that should be protected.
5. Make pictures of five wild flowers that should be protected.
6. Learn to recognize two species of Climbing Roses.
7. Locate principal parts of a flower: Calyx, petals, stamen, pistil.
8. Discuss function of each part.
9. Note that all flowers do not contain both of these; that the stamens and pistils are sometimes on different flowers or even on different plants. (The pumpkin is an example of the first; the Ailanthus tree of the second)
10. Discuss ways in which pollen is carried to flowers that contain pistils only.

Desirable: Stereographs of flower parts. Send for list to Keystone View Company, Meadville, Pennsylvania.

VIII. WEEDS

A. Problems and Experiences

1. To consider damage done by weeds.

B. Suggested Activities

1. Discuss effect of weeds on production.
2. Pupils observe
   (a) Pieces of fertile land almost or entirely overgrown with weeds.
   (b) Planted areas in which production is lessened because of weeds.
3. Discuss need for destruction of weeds growing on unused land.
4. Determine methods through which weeds may be kept down in cultivated fields.

IX. COMMUNITY LAWNS

A. Problems and Experiences

1. To find how to secure good lawns.

B. Suggested Activities

1. Review points respecting grass in Grade V.
2. Report good home lawns.
3. Committee visit good lawns reported and decide three best among these lawns.
4. Pupils whose lawns have been chosen report type of seed used and care given to lawn.

X. INSECT GARDEN PESTS AND DISEASES

A. Problems and Experiences

1. To identify principal garden diseases and insect pests on Spring plants.
2. To find how to prevent and destroy such diseases and insect pests.

B. Suggested Activities

1. Review material in previous grades respecting insect pests.
2. Collect and place in cages or glass receptacles principal insect pests found in neighborhood with plant or flower upon which it is feeding.
3. Note conditions under which above insects are most numerous: in shade, in sunlight, in damp weather, in dry weather.
4. Consult people in neighborhood who are interested in cultivation of flowers, fruits and vegetables as to their methods for prevention and extermination of insect pests.
5. Make a chart with drawing of each of these insect pests in first column, name of pest in second column, names of principal plants it attacks in third column, and method for its prevention and eradication in the fourth column.
6. Observe diseased plant growths.
7. Identify most common diseases found.
8. Consult people in neighborhood who have good growths of plants that these diseases attack as to methods used to protect their gardens.
9. Make chart for plant diseases in neighborhood similar to chart for insect pests.

XI. STATE FORESTS

A. Problems and Experiences

1. To find why the State Forests have been established.

2. To find why National Forests have been established.
3. To consider the pleasure of outdoor life.
4. To find opportunities for establishing a summer camp or home in the State Forests.

B. Suggested Activities

1. Discuss reasons for the establishment of State and National Forests.
2. Find nearest counties that contain State Forests; the county that has the largest area of State Forests; the second largest; the third largest. (Pennsylvania Department of Forests and Waters. Bul. 37, The State Forests of Pennsylvania, p. 5)
3. Locate National Forests within Pennsylvania. (Allegheny and Tobyhanna Forests. Total of more than 235,000 acres).
4. Locate some other National Forests in the United States. (See encyclopaedias)
5. Pupils who have visited State or National Forests report their experiences.
6. Find name of Pennsylvania State Department organized to preserve, extend and take care of trees and forests; of the National Department organized for national work in the same fields. Write to Superintendent of Documents, Washington, D. C. (ten cents) for list of scientific and nature study publications by this department. Pupils examine these lists and send for any bulletins desired.
7. How are State Forests protected from fire and other dangers?
8. Discuss following topics:

   The pleasures of a vacation spent in a forest area.

   The advantages of a camp site in a State Forest; of a permanent camp site.

   How permanent camp sites may be obtained in the State Forests.

   (Pennsylvania Department of Forests and Waters, Circular 34, State Forest Camp Sites in Pennsylvania, p. 5)
9. Read in the bulletin, In Penn's Woods, Bul. 31, Pennsylvania Department of Forests and Waters, the history of the nearest State Forest Park and also of any State Forest Parks that pupils may have visited.
10. List interesting subjects, such as birds and flowers, that people who camp in the State Forests may observe and study.
11. Read State Forest rules. (Pennsylvania Department of Forests and Waters, Bul. 31, In Penn's Woods; Circular 34, State Forest Camp Sites in Pennsylvania)
12. Write a short play illustrating a vacation spent in a State Forest. Illustrate.
13. Correlate State Forests with Arbor Day.

Desirable: Film: In Penn's Woods, Pennsylvania Board of Censors, Harrisburg, Pennsylvania. Free.

XII. TREES

A. Problems and Experiences

1. To extend identification of trees.
2. To learn how trees maintain life.
3. To learn how to bud or graft an apple tree.

B. Suggested Activities

1. Master identification of ten trees in Spring and Summer dress. Look especially for trees among those listed for Grades II-V, Appendix.
2. Discuss how trees maintain life. (Illick, Common Trees of Pennsylvania, The Food of Trees, page 8)
3. Identify five fruit trees as they appear in the Spring and Summer. Look particularly for the following: Apple, Peach, Cherry, Plum, Pear trees.
4. Note differences in Spring between Poison Sumach and Harmless Sumach.
5. Discuss other possible poisoning of skin through trees, plants and vines found in neighborhood.
6. Find how to graft and how to bud young fruit trees. (Among other sources, Our Farm World, Chapter VIII, Longmans, Green and Co., New York)
7. Find whether apple growers in neighborhood recommend budding or grafting.
8. If the apple trees planted in Autumn of Grade V are ready, bud or graft, as advised, with type of apple desired.
9. Correlate unit with Spring Arbor Day.

XIII. SCIENCE IN THE HOME

A. Problems and Experiences

1. To find how the electric fan works;
2. To find how the thermos bottle and the fireless cooker help to preserve and prepare food.

B. Suggested Activities

1. Explain what happens when an electric fan is connected with the electric current.
2. Determine how the electric fan cools the air.
3. Explain the principle of the thermos bottle; the fireless cooker. Discuss ways in which they help in the home.

XIV. CONSERVATION OF WILD LIFE AND PLANTS

A. Problems and Experiences

1. To consider changes in animal, bird and plant life due to destruction by man.
2. To determine the characteristics of a good sportsman.

B. Suggested Activities

1. Story of extermination of the bison as an example of the extermination of animals.
2. Story of the extermination of the passenger pigeon as an example of the extermination of birds.

For the teacher: The following information respecting the passenger pigeon is taken from the Classroom Teacher, Vol. 8, p. 267, The Classroom Teacher, Inc., Chicago, Illinois: "In North America, within the last hundred years, six species of birds have been completely exterminated. The Great Auk, the Eskimo Curlew, the Passenger Pigeon, the Labrador Duck, the Pallas Cormorant, and the Carolina

Parakeet have all disappeared before the direct attacks of man. The story of the passenger pigeon is the most spectacular, because not more than fifty or sixty years ago there were untold millions of these birds. In 1869, one Michigan town shipped 11,880,000 pigeons in forty days. Another Michigan town shipped 15,840,000 dead birds in two years. The birds were shot, netted, and clubbed, and, though their numbers ran up into the millions, today not one passenger pigeon survives. Can we learn from this and other similar experiences to protect our wild life? Apparently not, for even now at least thirty species of birds are threatened with extinction and probably have not been seen by any member of your class anywhere except possibly in the zoo. The list includes the Whooping Crane, the American Flamingo, the Scarlet Ibis, the Upland Plover, several species of Sandpipers, the Wood Duck, the Heath Hen, the Sage Grouse, and others."

3. Pupils ask their grandparents for names of birds and animals that were common when they were small boys and girls, that have entirely or almost entirely disappeared from the neighborhood.
4. Discuss reasons for establishment of state game preserves and birds refuges in Pennsylvania; locate nearest such refuges. (Pennsylvania Board of Game Commissioners, Bul. 9, A Year's Program for Bird Protection in Pennsylvania).
5. Discuss noted game preserves and bird refuges in other parts of country; for example, the Bok bird refuge in Florida (World Almanac, 1929).
6. Individual pupils report bird or game refuges which they have visited.
7. Discuss reasons for scarcity of plants and flowers that are listed as needing protection in Preservation of Wild Flowers in Pennsylvania, published by the Pennsylvania Department of Agriculture, Harrisburg, Pennsylvania.
8. Discuss the following questions:
   Why has the State Legislature made laws for the protection of plants and flowers? (These laws are also included in above bulletin). What is the duty of every good citizen who may see any person breaking this law?
9. Discuss the following Honor Code of the Woods and Waters prepared by a member of the Pennsylvania Board of Game Commissioners.

Honor Code of the Woods and Waters

First of all, "play fair" with all outdoors. Be a real sportsman to all the world, whether man or beast or bird or flower.

Have a proper contempt for the killing of wild life for sale, and refuse to buy wild game or trophies in the market; a true sportsman kills his own game, and then kills only for himself and family.

No matter how much fish or game the law allows as a bag limit, take no more than you reasonably need. Make your aim not merely to see how much you can catch or kill, but conservation and propagation for another day, both for yourself and for the generations yet to come. Fish are not all of fishing nor "meat in the pot" any great part of hunting.

Never pull wild flowers recklessly or to let them wither and be thrown away. Never be such a "poor sport" as to gather wild flowers for sale.

Never rob a bird's nest. It is both cruel and unfair.

Be careful never to do anything that may start a forest fire. It kills valuable timber that it will take many years to grow again. It spoils the beauty of the outdoors, and destroys the cover and protection for birds and wild animals. It often burns up the nests and young of birds, and even burns up young game animals.

Never fish or hunt on farm lands without the owner's permission. Never leave gates open, nor injure nor alarm the farmer's cattle, nor shoot near his house or his stock, nor take his fruit, nor trample down his crops. Not only respect the farmer's rights yourself, but report to him and assist him in bringing to justice any others who break the laws protecting these rights.

Never, under any circumstances, shoot until you see clearly what you are shooting at, and that you are in no danger of shooting any human being.

Obey all laws, whether you think they are reasonable or not. Laws are "the rules of the game" that men have worked out by their experience in trying to live together in civilized society. Though you may think it would improve the game if some of the rules were changed, yet be sportsman enough to "play with the team" and "play by the rules of the game" till they are changed in the proper way.

Desirable: Film: Wild Life Conservation, Pennsylvania Board of Censors, Harrisburg, Pennsylvania. Free.

Helps For The Teacher In Evaluating Progress

1. Are your pupils able to make the identification suggested?
2. Were pupils successful in their attempts to set up gardens and grow house plants?
3. Are they interested in the preservation of wild flowers and plants? Do you think they will report infractions of the laws respecting picking or breaking shrubs or flowers that they may observe?
4. Are any pupils in the class planning to camp in a State Forest during the Summer? Have any permanent camp sites in State Forests been obtained as a result of the study of this topic?
5. Have any additional scientific helps for the home been added in the homes of pupils as a result of the study of this subject?
6. Were the pupils in the class interested in the Honor Code of the Woods and Waters? Do you think they will practice this code?
7. Has the growing and budding or grafting of apple trees been successful? Are pupils interested in caring for these trees in the future?
8. Examine the course of study in science for Grade VII.
9. Are your pupils ready to take up the material in this course? Do you feel that the study of science has stimulated the practice of desirable character traits?
10. Organize tests covering points covered during the year that you think the pupils in the class should know. Remove any difficulties that these tests may indicate.
11. Do pupils know the State bird? The State tree?

References

Comstock, Anna, Handbook of Nature Study
Craig, Gerald, Tentative Course of Study in Elementary Science for Grades V and VI
Craig, Gerald & Johnson, Goldie M., Pathways in Science, Book VI. Our Earth and Its Story
Downing, E. R., Our Living World
Downing, E. R., Our Physical World
DuPuy, William Atherton, Our Insect Friends and Foes
DuPuy, William Atherton, Our Animal Friends and Foes
DuPuy, William Atherton, Our Bird Friends and Foes
DuPuy, William Atherton, Our Plant Friends and Foes
Green, George, A Survey of Nature
Gress, Ernest, Common Wild Flowers of Pennsylvania
Illick, Joseph, Common Trees of Pennsylvania

Medsger, Oliver, Nature Rambles-Spring

National Geographic Society, Washington, D. C., Pictures of Animals, Flowers, Fish

Pennsylvania State College, Ext. Circular 109, March 1927, Training the Young Apple Tree; Circular 122, April 1929, Vegetable Garden Insects

Perry Picture Company, Malden, Mass., Pictures of Birds

Persing & Hollinger, Elementary Science by Grades, Book VI

State Board of Game Commissioners,
- Bul. 9, A Year's Program for Bird Protection in Pennsylvania
- Bul. 10, Game Administration in Pennsylvania
- Bul. 11, More Food for Upland Game
- Bul. 13, Hatching and Rearing Ringnecked Pheasants
- Bul. 14, Pennsylvania's State Game Refuges and Public Hunting Grounds
- Bul., Trapping Methods

State Department of Agriculture, Compilation of Laws relating to Agriculture and the Laws Administered by the Department of Agriculture
- Bul. 452, White Pine Blister Rust
- Bul. 457, White Pines and the Blister Rust
- Bul. 469, European Corn Borer Control and Quarantine Regulations
- Bul. 473, The Japanese Beetle in Pennsylvania
- Bul. 508, Preservation of Wild Flowers

State Department of Health, Rules and Regulations for Control of Sanitation in Camps Used by the Public

State Department of Internal Affairs, Bul. G-3, Pennsylvania Caves

Sutton, George, Birds of Pennsylvania, J. Horace McFarland Company, Harrisburg, Pa.

Ullrich, F. T., Our Farm World

United States Department of Agriculture, Bul. 1371, Diseases and Insects of Garden Vegetables

Vinal, William, Nature Guiding

World Almanac

Bibliography—Grades One to Six

Special References

American Society for Prevention of Cruelty to Animals, New York City.
- Lessons for Teaching Humane Education—Nature.

Pennsylvania State College, State College Pennsylvania.
- Ext. Circular 109, March 1927, Training the Young Apple Tree.
- Circular 122, April 1929, Vegetable Garden Insects.
- Circular 140, Fly Protection.
- Bul. 277, Emergence Cages and Bait Pails for Timing Coddling Moth Sprays.

State Board of Fish Commissioners, Harrisburg.
- Bul. 1, Fish Ponds for the Land Owners.
- Bul. 2, Selective Breeding of the Yellow Perch.
- Bul. 4, A Treatise on the Fish of Pennsylvania.
- Bul. 5, Methods Employed for the Care of Gold Fish.
- Bul. 6, Frogs.

State Board of Game Commissioners, Harrisburg.
- Educational Leaflet No. 1, Descriptive Stories of Pennsylvania's Game and Fur Bearing Animals.
- Bul. 9, A Year's Program for Bird Protection in Pennsylvania.
- Bul. 10, Game Administration in Pennsylvania.
- Bul. 11, More Food for Upland Game.
- Bul. 12, The Pennsylvania Deer Problem.
- Bul. 13, Hatching and Rearing Ringnecked Pheasants.
- Bul. 14, Pennsylvania's State Game Refuges and Public Hunting Grounds.
- Bul. 15, An Introduction to the Mammals of Pennsylvania.

State Department of Agriculture, Harrisburg.
- Bul. 439, Peach Yellows and Little Peach.
- Bul. 448, Pennsylvania Weeds, Their Control and Eradication.
- Bul. 452, White Pine Blister Rust.
- Bul. 457, White Pines and the Blister Rust.
- Bul. 469, European Corn Borer in Pennsylvania.
- Bul. 473, The Japanese Beetle in Pennsylvania.
- Bul. 477, The Oriental Fruit Moth.
- Bul. 480, Scale Insects Injurious in Pennsylvania.
- Bul. 481, The Hessian Fly in Pennsylvania.
- Bul. 489, Mexican Bean Beetle in Pennsylvania.
- Bul. 502, Feeding Stuffs Reports, 1930.
- Bul. 504, Fertilizer Reports, 1930.
- Bul. 507, Explanation of Pennsylvania Seed Law and Report of Seed Analysis.
- Bul. 508, Preservation of Wild Flowers.
- Compilation of Laws Relating to Agriculture and the Laws Administered by the Department of Agriculture.

State Department of Forests and Waters, Harrisburg.
- The common Trees and Shrubs of Pennsylvania.
- Bul. 31, In Penn's Woods.
- Bul. 35, Lessons in Forest Protection.
- Bul. 37, The State Forests of Pennsylvania.
- Circular 28, Plant Forest Trees on Idle Acres.
- Circular 29, Forest Tree Planting Recommendations.
- Circular 31, Forest Trees to Plant.
- Circular 34, State Forest Camp Sites in Pennsylvania.

State Department of Health, Harrisurg.
- Rules and Regulations for Control of Sanitation in Camps Used by the Public.

State Department of Internal Affairs, Harrisburg.
- Bul. G-3, Pennsylvania Caves.

United States Department of Agriculture, Washington, D. C.
- Farmers Bul. 1371, Diseases and Insects of Garden Vegetables.
- Farmers Bul. 1456, Homes for Birds.
- Farmers Bul. 1569, Earthworms as Pests and Otherwise.
- Farmers Bul. 1591, Transplanting Trees and Shrubs.
- Misc. Circular 98, The Forest, A Handbook for Teachers.
- Bulletin, The Colorado Potato Beetle.

General References

Caldwell and Curtis, Introduction to Science; Ginn and Company, Boston, 1929.

Comstock, Anna, Handbook of Nature Study; Comstock Pub. Company, Ithaca, N. Y., 1927.

Craig, Gerald, Tentative Course of Study in Elementary Science, Three volumes; Grades I and II, Grades III and IV, Grades V and VI; Teachers College, Columbia University, New York City, 1927.

Craig, Gerald and Burke, Agnes, Pathways in Science, Book I, We Look About Us; Ginn and Company, Boston, 1933.

Craig, Gerald, and Baldwin, Sara E., Pathways in Science, Books II and III, Out-of-Doors; Our Wide Wide World; Ginn and Company, Boston, 1932.

Craig, Gerald, and Hurley, Beatrice Davis, Pathways in Science, Book IV, The Earth and Living Things; Ginn and Company, Boston, 1932.

Craig, Gerald, and Condry, Margaret G., Pathways in Science, Book V, Learning About Our World; Ginn and Company, 1932.

Craig, Gerald, and Johnson, Goldie M., Pathways in Science, Book VI, Our Earth and Its Story; Ginn and Company, Boston, 1932.

Downing, E. R., Our Living World; Longmans Green and Co., N. Y., 1924.

Downing, E. R., Our Physical World, Longmans Green and Co., N. Y., 1924.

Duncan, F. M., and Duncan, L. T., Animal Friends; Oxford University Press, N. Y., 1927.

Duncan, F. M., and Duncan, L. T., Bees, Wasps and Ants; Oxford University Press, N. Y., 1929.

DuPuy, William Atherton, Our Insect Friends and Foes; Winston Company, Phila., 1925.

DuPuy, William Atherton, Our Animal Friends and Foes; Winston Company, Phila., 1925.

DuPuy, William Atherton, Our Bird Friends and Foes; Winston Company, Phila., 1925.

DuPuy, William Atherton, Our Plant Friends and Foes; Winston Company, Phila., 1930.

Edwards, Paul G. and Sherman, James W., Nature Activity Readers; Little Brown and Co., Boston, 1931.
- Book I, Outdoor Land
- Book II, Outdoor Playhouse
- Book III, Outdoor World

Fox, Florence C., How the World Rides; Scribner, N. Y., 1929.

Gehrs, John H., Agricultural Nature Study, Books I and II; American Book Co., 1929.

Green, George R., A Survey of Nature; The Slingerland-Comstock Co., Ithaca, N. Y., 1926.

Gress, Ernest M., Common Wild Flowers of Pennsylvania; The Times Tribune Co., Altoona, 1928.

Illick, Joseph, Common Trees of Pennsylvania; The Times Tribune Co., Altoona, Pa., 1926.

Matheny, W. A., Seed Dispersal; The Slingerland-Comstock Co., Ithaca, N. Y., 1931.

Medsger, Oliver P., Nature Rambles—Spring; Frederick Warne & Co., N. Y., 1931.

Mooney, James E., Air Travel; Scribner, N. Y., 1930.

National Geographic Society, Washington, D. C., Colored Pictures of Animals, Flowers, Fish.

Perry Picture Company, Malden, Mass., Pictures of Birds

Persing, Ellis C. and Peeples, Elizabeth K., Elementary Science by Grades; Appleton, N. Y.
- Book I, 1930.
- Book II, 1928.
- Book III, 1928.

Persing, Ellis C. and Wildman, E. E., Elementary Science By Grades; Appleton, N. Y.
- Book IV, 1929.

Persing, Ellis C. and Thiele, C. Louis, Elementary Science By Grades; Appleton, N. Y.
- Book V, 1930.

Persing, Ellis C. and Hollinger, John A., Elementary Science By Grades; Apleton, N. Y.
- Book VI, 1930.

Shoffner, Charles P., The Bird Book; Frederick A. Stokes Company, N. Y., 1929.

Sutton, George M., Birds of Pennsylvania; J. Horace McFarland Co., Harrisburg, Pa., 1928.

Thomas, Roy H., Living Things Around Us; Lippincott, Philadelphia, 1928.

Ullrich, F. T. Our Farm World; Longmans Green and Co., N. Y., 1929.

Vinal, William, Nature Guiding; Comstock Publishing Company; Ithaca, N. Y., 1926.

World Almanac, The World, New York City. (Yearly edition).

APPENDIX

BIRDS

GRADE	PERMANENT	MIGRANT	WINTER ONLY
I	Starling	Robin	
II	Hairy Woodpecker	Scarlet Tanager English Sparrow Crow	
III	Goldfinch White-breasted Nuthatch	House Wren Meadowlark Bluebird Purple Grackle Bronze Grackle Baltimore Oriole	
IV	Song Sparrow Cardinal	Catbird Red-headed Woodpecker Barn Swallow Chipping Sparrow Field Sparrow Cowbird Phoebe	Tree Sparrow Slate Colored Junco Golden Crowned Kinglet
V	Blackcapped Chickadee Screech Owl Great Horned Owl	Ovenbird Redstart Ruby-Throated Humming Bird Brown Thrasher Cerulean Warbler Northern Flicker	Tree Sparrow Slate Colored Junco Golden Crowned Kinglet
VI	Game Birds: Bob White (Quail, Partridge) Ring-necked Pheasant Ruffed Grouse		

FOREST AND ORNAMENTAL TREES

GRADE	SPECIES OF TREE
I	Pussy Willow Hickory Spruce
II	Oak Weeping Willow Hemlock Arbor Vitae (Cedar) Cottonwood Hawthorn
III	Sugar Maple (hard) Silver Maple (soft) Birch Black Walnut Tulip Tree Locust Pawpaw Box Tree
IV	Stag Horn Sumach Smooth Sumach Poison Sumach Horse Chestnut Elm Butternut Hornbeam (Ironwood) Black Gum
V	Red Oak White Oak Witch Hazel Ash Ailanthus American Holly Buttonwood Sassafras Catalpa
VI	Ten Trees

FLOWERS

GRADE	SEASON	GARDEN FLOWERS	HOUSE OR GREEN-HOUSE PLANTS
I	Autumn	Marigold Nasturtium	
	Winter		Poinsettia Geranium
	Spring and Summer	Bachelor's Button Forget-me-not Easter Lily Crocus	
II	Autumn	Mignonette Phlox Sunflower	
	Winter		Carnation Rose Rubber Plant
	Spring and Summer	Garden Pinks Lily of the Valley Pansy Tulip Snapdragon Portulaca	
III	Autumn	Poppy Gladiolus Cosmos	
	Winter		Chrysanthemum Begonia Azalea Fuschsia
	Spring and Summer	Sweet William Columbine Honeysuckle Bleeding Heart Iris Lilac	
IV	Autumn	Salvia Canna Morning Glory Aster Sweet Alyssum	
	Winter		Maiden Hair Fern Boston Fern Fan Palms Gloxinia
	Spring and Summer	Peony Snowball Wisteria Verbena Sweet Peas	
V	Autumn	Scabiosa Zinnia Dahlia Chinese Lantern African Golden Daisy Phlox—annual	
	Winter		Orchid Calla Lily Hydrangea Caladium
	Spring and Summer	Rose Clematis Delphinium Petunia Tuberose Hollyhocks	
VI	Autumn	Fourteen Garden Flowers	
	Winter		Eight House or Greenhouse Plants
	Spring and Summer	Fourteen Garden Flowers	

WILD FLOWERS

GRADE	AUTUMN	SPRING AND SUMMER
I		Dandelion *Arbutus Buttercup
II	Goldenrod Ox-eye Daisy (White Daisy) Red Clover Touch-me-not	Violet Bluet Spring Beauty Crane's Bill Milkweed *Marsh Marigold
III	Black-eyed Susan (Yellow Daisy) Thistle Evening Primrose	*Bloodroot *Dogwood *Dog's Tooth Violet *Lady's Slipper Wild Rose Bouncing Bet Yellow Pond Lily Toothwort Ground Ivy *Dwarf Cornel *Coral Root Moth Mullein
IV	Queen Anne's Lace Butter and Eggs Yarrow *Ladies Tresses	Indian Pipe *Dutchman's Breeches Squirrel Corn *Trillium Wild Blue Phlox Skunk Cabbage *Bluebell Devil's Paint-Brush False Solomon's Seal Early Saxifrage *Columbine Self Heal *Showy Orchid *Dragon's Mouth
V	*Closed Gentian *Fringed Gentian Wild Aster Witch Hazel	Water Lily May Apple Jack-in-the-Pulpit *Mountain Laurel *Turk's Cap Lily Wild Ginger *Hepatica Rue Anemone (Wild Flower) Wild Strawberry Arrowhead Boneset *Rhododendron Cattail *Cardinal Flower *Pogonia
VI	Four Wild Flowers	Eight Wild Flowers

*Wild Flowers that should be protected.